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N.E.L.A. ISSUE—MAY 26, 1928

ELECTRICAL WORLD editors have been busy for months on a survey of the light and power industry. The results of this survey will appear in the special N.E.L.A. issue dated May 26. The editors have visited every state in the Union to get facts, opinions and other data which will serve to measure utility accomplishments. The data and opinions in this issue afford the ablest answer to criticisms of the light and power industry. They should be read by every man interested in utility affairs.

But these survey articles do not complete the issue. In addition, leaders of the light and power industry will comment on current problems and accomplishments and special articles will deal with paramount issues of vital interest to the utility industry. To get full value from the Atlantic City N.E.L.A. convention read the May 26 issue of ELECTRICAL WORLD.

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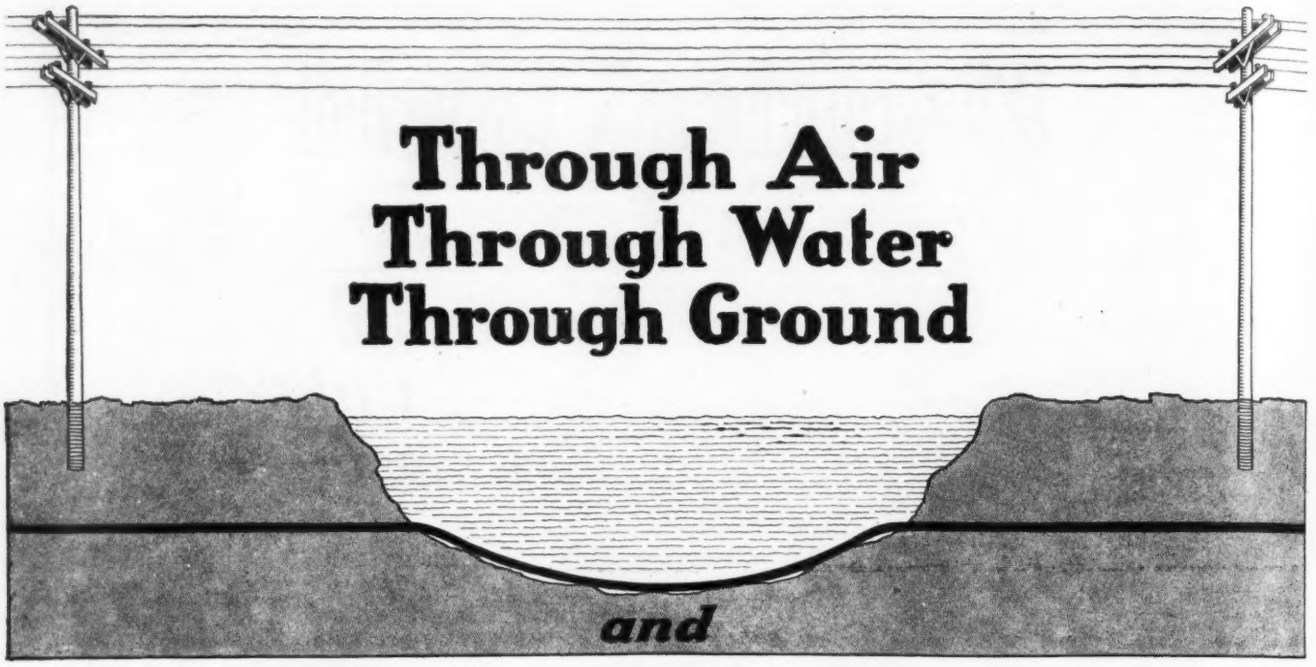

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Electrical World

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Editor

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Business Called Into Action

ITS sixteenth annual meeting in Washington last week showed the Chamber of Commerce of the United States to be stronger and more representative of American business than ever. In a country that tops the world, so to speak, it is to be expected that a democratic body like the chamber will acquire with years inspiration for greater and better endeavors and also increase in moral stamina; otherwise it could neither wield much influence nor impart any of that motivating force which emanates from leadership and which American business must have to encourage and sustain it.

Outwardly all these qualities were visible at Washington only because the inner organization, containing the hewers of wood and drawers of water, was functioning. It is in the thoroughness of its detail work that the Chamber of Commerce of the United States makes its appeal, and its machinery of organization is geared to serve American business effectively and economically. This year the chamber seems to have struck a high note, and although the sound may not have been heard or heeded in the halls of Congress, the business world and the local chambers of commerce will carry out the program and make it effective.

* * * *

Keep the Escutcheon Clean!

AS THE time approaches for Congress to adjourn—and for obvious reasons many Senators and Congressmen are anxious to get away early—the legislative outlook is promising. That is to say, little affecting the electrical industry will be enacted into law. On the Boulder Canyon bill are beginning to appear the dew and clammy coldness of death. The Muscle Shoals measures may succeed in getting before a hostile conference committee, but any conference report now appears hardly likely of passage. No other major legislation affecting the industry is pending.

Of course, it is to be expected that the Federal Trade Commission will continue its hearings and report monthly. It has already uncovered unsavory material which is being interpreted and played up in a way not complimentary to the electric public utilities. Viewed with even friendly eyes, the exhibition is not attractive, and wisdom and prudence dictate some heroic action on the part of the industry to thwart growing congressional unfriendliness and possible undermining of general public relations. The picture, however, is not so bad as it is painted.

Financially, the investors show greater faith in the industry than ever, and reports of operating companies more than justify that faith. Neither the Federal Trade Commission nor the Senate can nullify the economic laws upon which the continued growth of the electrical industry is predicated. None the less, the industry must not on that account permit the public to gain the impression that electric public utilities have been recreant to the trust reposed in them. The industry is obligated to render the very best service at the lowest possible rates. That motto is emblazoned on its shield, and when mud, no matter how much, is thrown at it, the mud should be quickly washed off and the shield reburnished, so that the message may never be lost to public view.

* * * *

Radio and Regulation

RADIO sets using alternating current should be equipped with a voltage-regulating device. Light and power companies are expected to regulate voltage at generating stations and substations to a degree which will give satisfactory service to all devices attached to outlets in the homes, but they cannot be expected to provide voltage regulation which will always give the best possible service to radio sets. The wiring in the homes, the use of many household devices and other factors inherent in a large utility system introduce cost and jurisdiction items beyond the control of utility executives.

Radio reception is a precision service, and, for a minimum of cost, the best place to adjust for precision service is in the radio set. Tap-changing transformers, a rheostat or other means can be used to tune a set for the home voltage when the radio equipment is first installed. Once adjusted for voltage conditions in each home, the set will give satisfactory service. Radio manufacturers and utility executives should agree on a joint policy while alternating-current radio is in its infancy. Both will suffer unless the voltage problem is solved as a co-operative task.

* * * *

System Insulation Improved

BETTER standards of service demand standards in system insulation that are rational and in advance of past practices. Hit-or-miss changes in insulation in the several parts of a system should give way to a co-ordinated plan that evaluates all system factors at each insulation point. This logical policy was stated by Philip Sporn at the New Haven meeting of the American Institute of Electrical Engineers last week; but the carrying out of the principle is difficult.

Insulation is a composite substance whose strength varies greatly with the materials used and with the physical test that can be had to give quantitative data on insulation strength, and as yet insufficient knowledge of lighting exists to permit the specification of tests which

will duplicate the possible service experiences of insulation. And, finally, either grading a system or making a system have uniform insulation introduces economic values and different service conditions which are not conducive to standardization. System engineers, however, can use part of the principle to advantage. If, as at present, money is spent to raise line insulation, then money should be spent to raise terminal equipment insulation so as to maintain relative values at least, and it may pay to raise the insulation of the terminal equipment to a higher level than that of the line.

The goal in insulation is continuous service for all the system. Any grading which makes weak spots in insulation may protect physical apparatus at the expense of system service; but such a policy is unsound except as a temporary expedient, and in this event the relief valve should be simple, inexpensive and least hazardous to continuous service. Until the actual phenomena that may occur on a system are known quantitatively there is little need for hard-and-fast rules for system insulation. Awaiting such knowledge, insulation must be the outcome of a mixture of experience, money, guesswork and good judgment.

* * * *

Indirection Pays Poorly

ONE lesson of the Federal Trade Commission's investigation of the electric power industry is this: Indirection does not pay. The utilities organized a wide-flung and apparently efficient bureau of information for the purpose of supplying the press and public with facts regarding electric, gas, telephone and electric railway service. Basic facts were printed in booklet form for use in schools, and other material was distributed to the press. The articles were cleanly labeled by the organizations that issued them; there was no anonymity, no attempt to evade responsibility, nothing to justify the adjective "insidious." Those to whom the reading matter was sent knew its source, and they were free to accept or reject it as their informed judgment should dictate. Many of them accepted it.

Now comes the wind from Washington to uncover what every one already knew. The information is condemned in the public prints as propaganda. The authors are pilloried as "the power trust"—which, of course, they are not. The industry gets blasted with column upon column of hypocritical criticism from many of the very papers which had published its material. It gets singed and crisped with the hot alibis of the very authorities who accepted its booklets as school texts. From which we cull the lesson that indirection hardly pays.

Now, there are many methods a business organization can employ in presenting its case to the public, and one of them is advertising. The forthrightness of paid advertising appeals to our American sense of square dealing. We figure that normally the advertiser must have faith in his business or he would not pay out good money to talk about it. The electric light and power industry should adopt this method of talking to its public more than heretofore, not alone because the method is more acceptable and effective than others, but because the industry cannot afford to neglect this avenue of publicity. The public information bureau proved somewhat of a boomerang. Much of the good it accomplished was wiped out by the denunciations which burst forth as a result of Washington inquiries. What the industry should now use is straight advertising—and plenty of it.

The National Electric Light Association should advertise liberally in telling the country about the merits of electric service. Every individual company should consider it a matter of course to use space in local papers. And the advertisements should be aggressive and not defensive. The industry should seek business, not sympathy, and it should do it soon.

* * * *

Railroad Power Contracts and Use of Utility Service

PROSPECTS are brightening for the increased use of purchased power by electrified steam railroads. Central-station men must rejoice at such expressions of hospitality toward their product as were heard last week at the New Haven regional meeting of the American Institute of Electrical Engineers from men like Vandersluis, Withington and Hill. It is highly gratifying to learn that the use of purchased power tends to increase service reliability in a field where interruptions are simply intolerable and that such insurance is worth a premium over the cost of producing energy in an isolated station owned and operated by the railroad interests themselves. Apparently the most advanced opinion in railroad circles recognizes the importance of being free to perform the specialized task of moving commodities and living freight from place to place with maximum economy.

Railroad power business, however, does not come to the modern utility on a silver platter. The discussion at New Haven brought out very clearly the importance of negotiating contracts on a liberal basis as regards the customer's operating situation. The problem of demand charges is at the forefront of current railroad thinking, and it is significant that most painstaking specification of this element is embodied in the recent Illinois Central and Pennsylvania Railroad contracts with the power companies serving them. In the former case the transportation company is allowed to exclude from billing abnormal peaks due to stated recognized emergencies. In the latter a clear-cut expression of how demands are to be determined provides for service capable of being expanded over a long period of years. The speakers made the point that the advantages of interconnection should be availed of in fixing demand charges and intimated that the modern railroad's inside position in the fuel and capital markets should also be recognized in the negotiation of power sales, cost of production being thereby made the base of energy rates.

Power companies are under no obligation to sell energy to railroads at a loss, and we do not believe this class of customers desires them to do so, if, indeed, the regulating commissions concerned would permit such discrimination. Obviously a power contract, whether made with a railroad or with a manufacturer of neckties for the Zulus, must be profitable to each party in the long run if it is to endure in good relations. The railroads seek to obtain the best service at the lowest prices available, just like any discriminating buyer. Per contra, well-run power companies desire a fair profit on the business which they handle after all costs are met. All that the situation requires is a thorough study of the possibilities and equities of each particular situation,

which then should find expression in a contract just to both sides and one designed to encourage the use of the service to the utmost desirable extent. The fine indorsement of purchased power at the New Haven meeting of the Institute should not be allowed to blind central-station men to the railroads' suggestion that various aspects of the economic problem deserve more thorough analysis in dealing with specific cases. The test of a good contract is its successful application, and no better evidence of this can be had than the satisfaction of both parties with an instrument which encourages the growth of business transacted with each other as the total volume of service rises.

* * * *

Fixed-Par Versus No-Par Stock

THERE is an unwarranted misunderstanding in many minds regarding the relative merits of par and no-par stock. It is less a question of merit than of significance. The price paid for a share of stock by the original shareholder is not important. Invested capital appreciates as earnings are turned back into the company or as the market or replacement value of corporate properties increases. Invested dollars depreciate with profitless operation and adverse economic conditions affecting real estate or replacement costs. The equity of the stockholder is always his per-share interest in a hypothetically liquidated concern. This amount may, and in fact must, at any conceivable instant after organization be either more or less than the sum paid in by him in assuming partial proprietorship.

The establishment of a par value represents an effort of historical interest to stabilize artificially a thing which very evidently cannot be stabilized in this way, however satisfying arbitrary assumptions may be. Par value is a term possessing no significance whatever, and, rather than affecting the rights of either stockholders or the public, it has no possible influence upon them—other than to render confused that which is amazingly simple. A fairly-arrived-at book value, per share, at the instant under consideration is the only proper par. Nothing may be added to or taken away from the equity of the stockholder or the value of the property by arbitrary statements or assumptions of value.

* * * *

Economic Balance in the Electrical Industry

A THOUGHT for electrical men as well as those connected with other industries came out of the convention of the United States Chamber of Commerce in Washington last week. There was naturally much said about the "new competition," the overproduction of commodities and the need for an intelligent attack upon the organizing of distribution in this country—the need for setting about the task and not just talking about it. More than one eminent speaker contributed to the crystallizing of this sensible conception. American industry is not suffering, they said, from too much production, but from production that is not in balance with consumption. We are not producing more things than people can use, but too often the wrong things, and the problem of the future will be to organize, regulate and correlate the supply and the demand. In a word, we must stop manufacturing more buttons than there are buttonholes, so to speak, and laying off for lack of market textile hands who are ready to work, when their own children need shirts that they are able to produce. Clearly this is neither logical, humane nor economic.

What does this mean in the electrical industry? For one thing, we have not in the past thought ahead and prepared the way for expanding markets in the home, store and factory by seeing that installations were made adequate for future needs when the wiring was put in. And so we see today power companies needing load and jobbers and manufacturers needing market that is blocked for lack of outlets. Meanwhile there are too many contractors suffering for lack of jobs, yet able and eager to install this wanted wiring—all owing to a lack of balanced preparation for future growth. Lack of industry statistics has prevented men forecasting the trends of growth and sensing the changing conditions, and factories have forged ahead, increasing capacity and intensifying competition, when often what were needed were goods quite different.

The future will demand more intelligent thought and unselfish planning, more market knowledge, more preparation and preadjustment for balanced development and growth. In the past there has been co-operation only when it was necessary to meet present and immediate embarrassment and need, but in the years ahead electrical men will have to learn to co-operate and organize to provide in advance for coming conditions and prevent the economic evils that inevitably follow the unbalancing of production, distribution and consumption in any market.

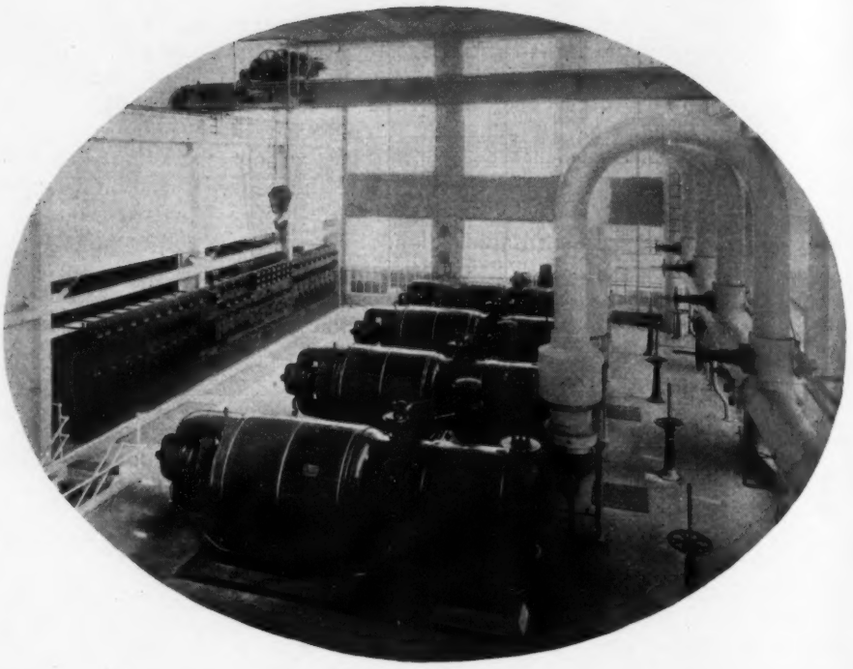
* * * *

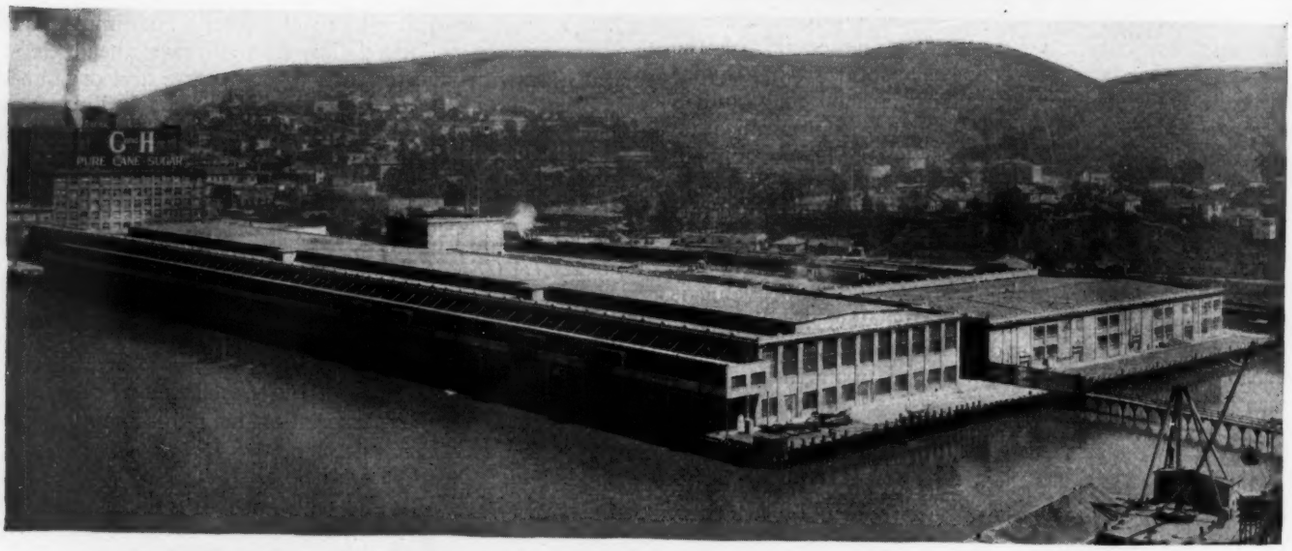
Code Work and Industry Progress

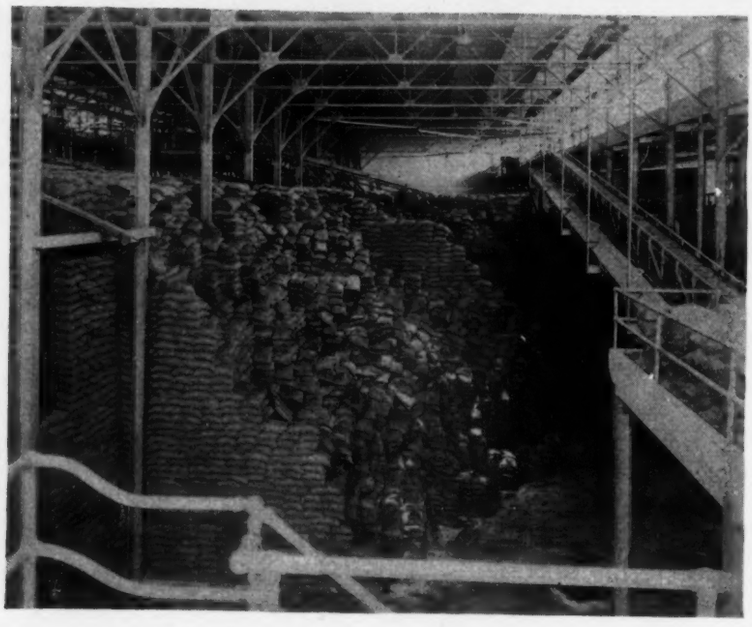
CODE work and the progress of the industry are so intertwined that there can be no separation if the code is to serve the best interests of the electrical art. At the meeting of the electrical committee of the National Fire Protection Association held this month, and later at the N.F.P.A. meeting, the 1928 code was accepted, subject to a letter ballot of the electrical committee, after which it will be sent to the executive committee of the N.F.P.A. and later to the American Engineering Standards Committee. While the correlating committee, which was appointed by the electrical committee at its last meeting to whip the code and the mass of new rules into shape, was not in a position to do as complete a job as might have been done prior to the February meeting, yet many rules were covered in the 1928 code that should prove valuable to the industry.

There are three major problems on which the attention of the article committees and the electrical committee must be focused in the future. They are: (1) To get into the code such rules as should have been incorporated prior to the 1928 code; (2) to add rules to cover the industry's current needs; (3) to bring the code up to date and to keep it in step with the progress in the art. The responsibility for the solution of these problems lies not with any one branch of the industry. It is a joint co-operative task. The code is a national institution, and a great deal of effort has been expended in the last three years to make it so. Any further growth of local regulations will tend to denationalize the code. Such regulations, regrettable as they may be, are invited if the code fails not only to catch up with the progress in the art but to keep constantly in step with it.

Production Processes in This Mill Co-ordinated by Electricity







ELECTRICAL applications in the plant of the California & Hawaiian Sugar Refinery at Crockett, Calif., have been an important factor in synchronizing production units and have made possible an uninterrupted flow of product from the receipt of raw sugar to delivery at the shipping platform. Automatic and semi-automatic control at key stations has reduced labor costs and removed the human element in co-ordinating production units. Hundreds of thousands of bags must be transported by conveyors. The applications are discussed in the following pages.

Electricity in Sugar Refining

Engineers of California & Hawaiian Sugar Refining Corporation produce electrical designs which speed up production and synchronize plant operations

By Louis F. Leurey
Consulting Engineer, San Francisco, Cal.

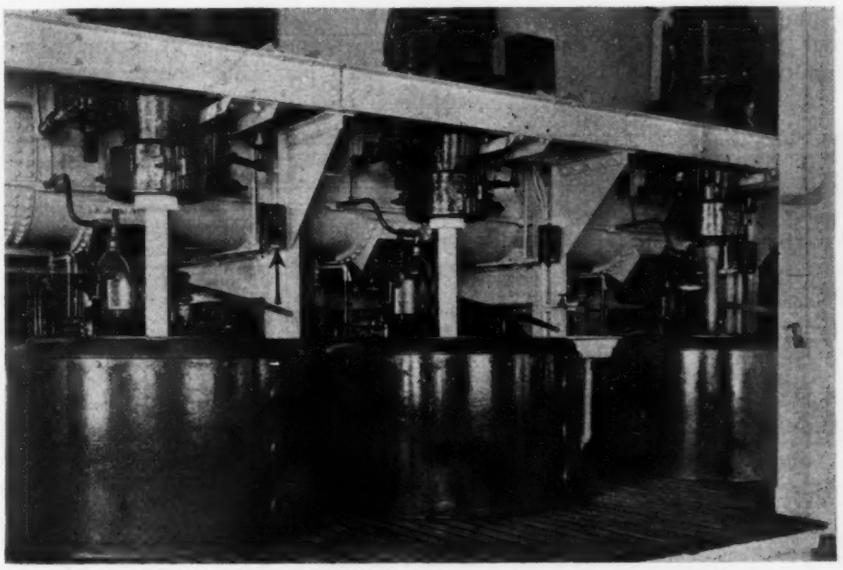
IN THE development of electrical usage at the plant of the California & Hawaiian Sugar Refining Corporation the engineering department has not been satisfied in applying all of the well-known methods of electrical drive and control but, being notably "electrically minded," it has gone extensively into the application of electricity as a medium in the accomplishment of industrial processes.

These engineers, in common with all engineers experienced in the manufacturing field, know that the greatest obstacle to synchronizing the various factors of production is the human element. Attacking the problem from this angle, they have made a special study of the salient factors which impede the uninterrupted flow of their product from the receipt of raw sugar to delivery at the shipping platform. They have found that the use of automatic and semi-automatic electrical control at certain key stations has not only reduced labor costs but has been a vital factor in co-ordinating the control of production units. Some of these applications are of consequence only in the sugar-refining process, but a number of important installations will be described where a similar application could be made to other products and are therefore of general interest in the manufacturing field. Before taking up the electrical applications in the plant it will be well to describe briefly the methods used in the process of refining sugar.

The plant of the California & Hawaiian Sugar Refining Corporation is situated at Crockett, Calif., on the shores of San Francisco Bay, and has a deep water frontage of 3,000 ft. It is served by ocean steamers, river craft and by connections to three transcontinental rail systems. The raw sugar is received in cargoes up to 14,000 tons from the Hawaiian Islands, and the Matson Navigation Company maintains a fleet of modern sugar-carrying vessels which transport up to 90,000 tons of raw sugar per month. The plant has a melting capacity of 2,500 tons of sugar per day, which is converted from the raw state into the various forms of refined product demanded by the American market.

Raw sugar comes from the Hawaiian Islands in 125-lb. bags, of approximately 98 deg. purity, which is landed from the ship's side in slings and conveyed directly to the refinery or to warehouse storage. The general refining process consists of the following operations:

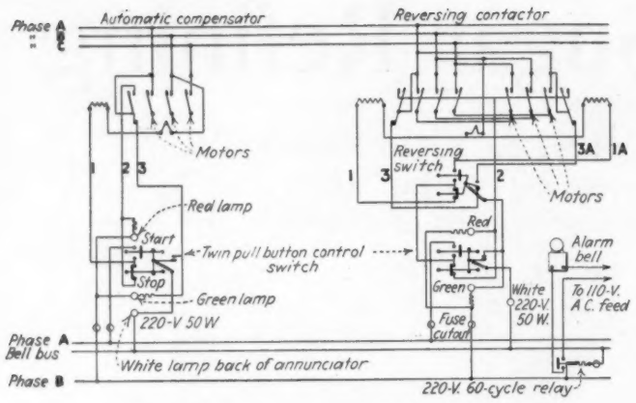
(a) *Washing* (Removal of External Impurities)—At the end of the main conveyor belts is a raw sugar bin, of 1,500 tons capacity, from the bottom of which the sugar is lifted in bucket elevators to a "mingler," where it is thoroughly mixed with syrup to give it "flow." The resultant mixture, called "magma," is allowed to flow into motor-driven centrifugals, where it is automatically washed by spray nozzles, thus raising its purity from approximately 98 to approximately 99.4 deg. Twenty-two raw sugar centrifugal machines, each one of which is driven by a 30-hp. motor, are required for this operation.



Raw sugar centrifugal station, consisting of 22-30-hp. motors driving centrifugal baskets

(b) *Melting* (Changing the Solid Raw Sugar into Liquid Form)—From the centrifugals the washed sugar drops into a cylindrical tank, where it is partially dissolved with hot water and stirred by revolving paddles until it reaches a concentration of 66 per cent of solid matter.

(c) *Filtration* (Removal of Insoluble and Soluble Impurities)—From the melting tank the solution is pumped to the top floor of the "char house," a nine-story building, where it is delivered to tanks and heated by steam coils to a temperature of 176 deg. F. At this point lime and kieselguhr (diatomaceous earth) are added. The kieselguhr absorbs some of the impurities

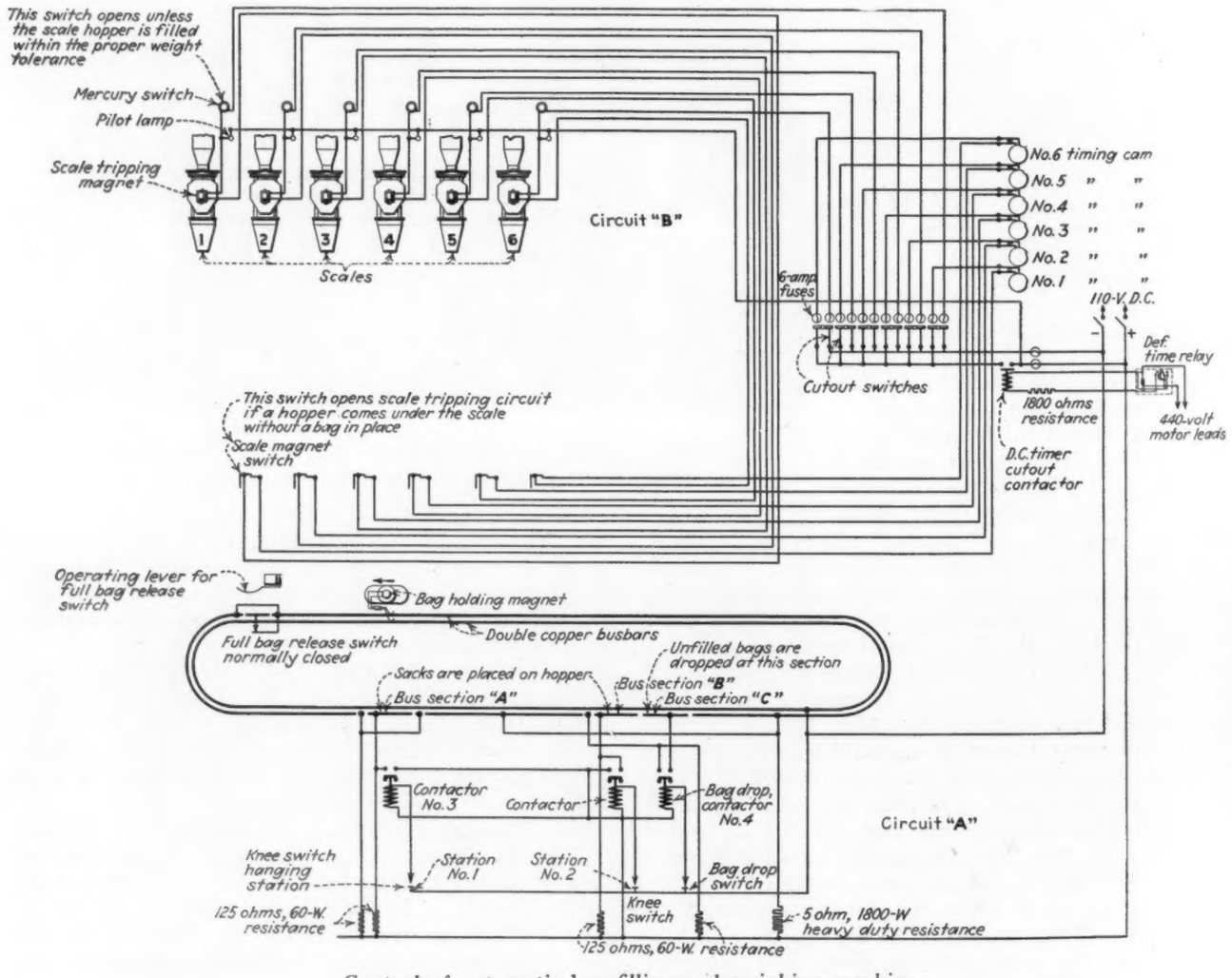


Wiring for remote control of warehouse conveyor motors

and in addition forms a porous coating against the filter cloths through which the sugar liquor passes. These filter cloths are contained in modern filter presses which remove from the liquor the insoluble impurities. From the filter presses the liquor is delivered to 108 char-filters. These char-filters each consist of heavy cast-iron tanks 10 ft. in diameter and 25 ft. in height, each containing 50 tons of "bone char," which is an animal charcoal ground to size between a 10- and a 30-mesh screen and calcined at a temperature of 1,200 deg. F. This filtration removes practically all of the coloring matter and considerable portions of the organic and mineral impurities present.

(d) *Crystallization* (Conversion of the Liquor into Sugar Crystals)—The sugar liquor now being pure white, with the greater part of the impurities removed, is then boiled under vacuum at low temperature in vacuum pans approximately 14 ft. in diameter and 17 ft. high. In approximately 1½ hours 38 tons of granulated sugar is delivered from these pans.

(e) *Drying*—Crystals from the vacuum pans are then spun in white sugar centrifugals, equipped with an automatic electrically controlled water spray, which washes and partially dries the sugar crystals. Final and complete drying is effected in an apparatus consisting of two large cylindrical drums, 6 ft. in diameter and 30 ft. long, each revolving with a slight downward pitch from the receiving to the discharging end. The first, or upper, "granulator" revolves slowly and carries on its inner edges narrow sawtooth shelves which cause the sugar to fall in a shower throughout the entire length of the drum. A strong current of air heated by steam coils and driven by a powerful fan is drawn through this "granulator" and dries the sugar to 0.1 of 1 per cent of moisture. The final drying is done in the lower drum or granulator carrying an internal steam heated drum about 24 in. in diameter, which revolves with the granulator. The sugar crystals fall in a shower from the shelves onto



Control of automatic bag-filling and weighing machine

this hot inner drum and are dried to a moisture content of about 0.05 of 1 per cent.

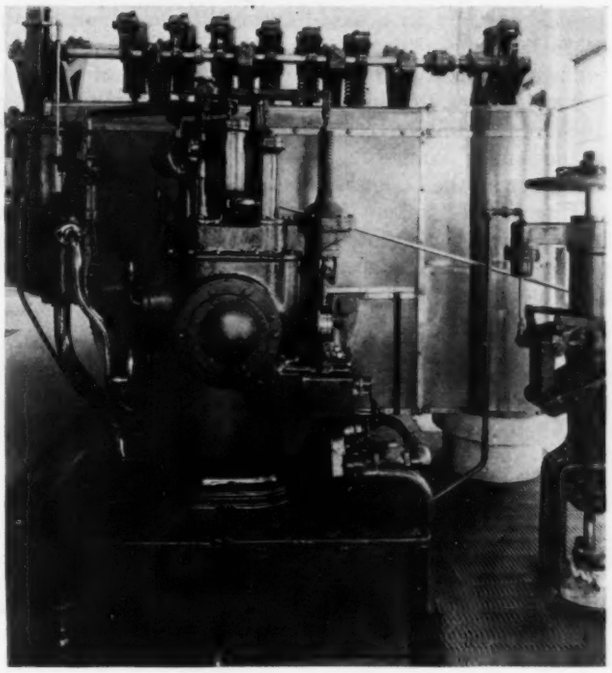
(f) *Sorting and Packing*—From the granulator the sugar is passed over separators which screen the crystals and sort the grains into coarse, medium and fine sizes. The sugar is then conveyed to the packing room. As many as fourteen grades of refined sugar are produced and packed in more than twenty various types of containers. The final product is of extreme purity, each grade being absolutely uniform as to color and granular structure, and in the entire process from raw sugar bin to final packed product it is at no time touched by the hands of the operators.

In addition to the main process described above, there are many intricate problems connected with the extraction of sugar from sweet waters and low-grade syrups, all requiring labor, machinery and fuel. It is sufficient to say here that these recovery operations are carried out to the limit of commercial economy.

Central Power Plant

As great quantities of steam at low pressure are required in the process of sugar refining and as all of this steam must necessarily be generated at standard boiler pressures a steam turbo-generator plant was designed to act as a pressure reducer between the boiler room and the low pressure mains. In this way all electrical power required for the refinery is recovered as a byproduct of this pressure-reducing process. The cost of electrical energy consists of the sum of the fixed charges on the turbo-generators and the turbine building, plus the annual operating costs of the turbines and the thermal loss between the throttle and the discharge pipe. The sum of all of these charges is much lower than the cost of purchased energy even under the favorable load factor of sugar refinery operation.

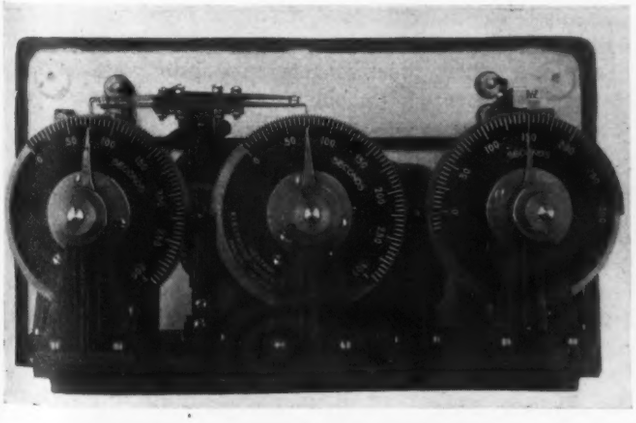
When it is considered that this power plant operates eleven months in the year, generating approximately 100,000 kw.-hr. per day, with an average load of 4,000 kw. and a maximum load of 4,500 kw., it can be readily appreciated that the power plant makes a very substantial return upon its investment. Three 1,500-kw., 440-volt, three-phase turbo-generator units exhaust directly into the 10-lb. low-pressure steam mains and do the regulating necessary for the electrical system. A fourth 1,500-kw. unit of single-stage design exhausts directly into the 70-lb. mains that supply the refinery vacuum pans.



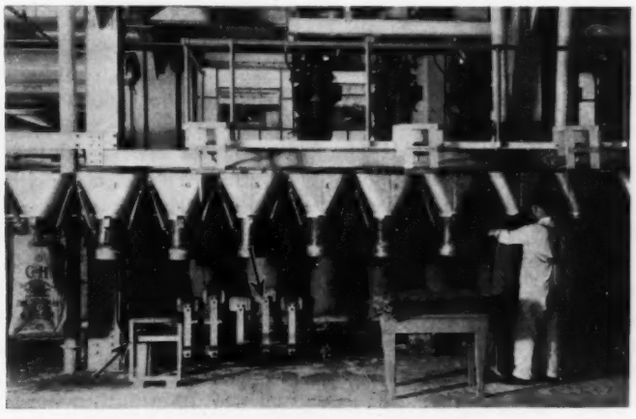
Close-up view of speed governor, pressure governor and valve gear, high back-pressure turbine

This high back-pressure turbine is of considerable interest due to several unique features incident to its operation. Requirements of the vacuum pan are such that a steady pressure is demanded, so that it was necessary to develop a pressure governor which would maintain a constant pressure over an adjustable range of from 55- to 70-lb. gage. The second requirement was that in maintaining this pressure the safe electrical output of the generator must not be exceeded, and the third requirement was that this machine must operate in parallel with the machines on the 10-lb. system.

The turbine, which is of General Electric manufacture, has met all of these requirements through a very ingenious design by the manufacturer. A mechanical pressure governor, as illustrated, has been incorporated with the hydraulic speed governor in such fashion as to maintain very steady pressure over a wide range of steam demands, and a contact-making ammeter acting on the pilot control motor of the speed governor oper-



Close-up view of motor-driven supervising relay for controlling raw sugar station



Automatic electrically controlled bag-filling and weighing machine

ates successfully as a load-limiting device whenever the turbine's electrical output exceeds a predetermined limit.

The vacuum pans often require more steam than can be handled by the high back-pressure turbine, and a Shield regulating valve, designed by the master mechanic of the sugar company, supplies the make-up steam directly from the boiler room mains. Two of the accompanying charts, taken from flow meters, indicate the steam passing through the turbine and the make-up steam supplied by the Shield regulating valve during a typical operating day.

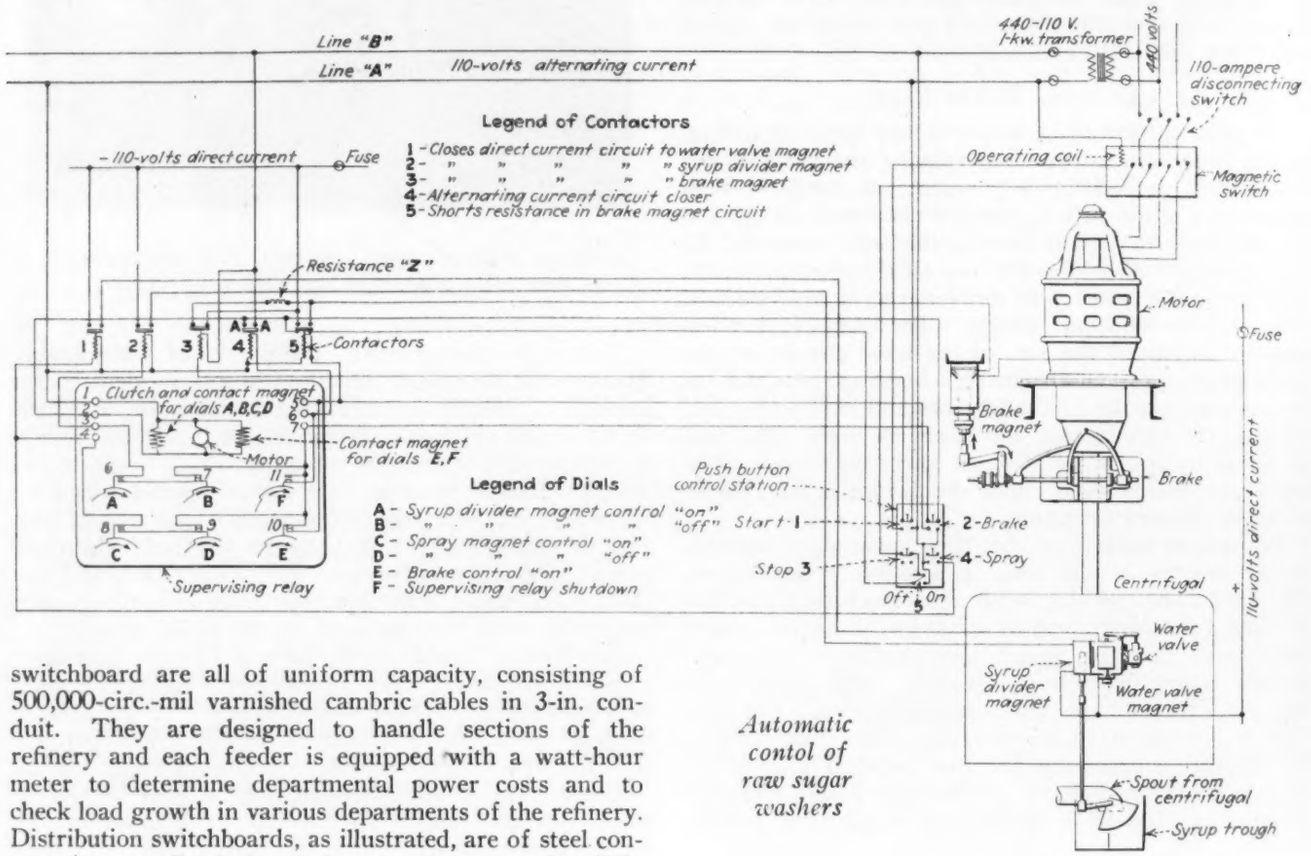
Switchboards and Feeders

The main switchboard is of very simple design and controls four 3,000-amp. generator breakers and 21 500-amp., 440-volt feeder breakers. The feeders from this switchboard are all of uniform capacity, consisting of 500,000-circ.-mil varnished cambric cables in 3-in. conduit. They are designed to handle sections of the refinery and each feeder is equipped with a watt-hour meter to determine departmental power costs and to check load growth in various departments of the refinery. Distribution switchboards, as illustrated, are of steel construction, totally inclosed front and rear and solidly grounded. All switches are equipped with a corporation lock, and painters are permitted to paint switchboards unattended in the same manner that they would paint tanks or building columns.

All sub-feeders in the refinery, with the exception of those controlling motors of more than 50 hp., have a uniform capacity of 100 amp. each and are so routed in the refinery areas as to accumulate a load equal to their wire capacity. Feeders of this "busbar" type connect to two or more motors until they are fully loaded to wire capacity, and the size of the feeder remains unchanged from the switchboard to the last motor. By the use of this system of sub-feeders and of fully loaded main feeders all copper in the entire refinery is operating near its full efficiency, the only exception being the copper in the individual motor circuit, where size is governed by the requirements of the National Electrical Code.

There are approximately 200 fractional horsepower motors in the refinery and 800 motors of the three-phase, 440-volt type in sizes from 1 to 350 hp., totaling approximately 12,000 connected horsepower. The average size motor in the refinery is only 15 hp., but in spite of this small average size it has been possible to maintain a station power factor of from 83 to 84 per cent This has been accomplished by the judicious loading of induction motors and the use of synchronous motors of 150 to 350 hp. in driving pumps and air compressors, and by the further use of a static condenser at the terminal of a main feeder of especially low power factor.

Motor controls are grouped wherever possible at conveniently accessible locations and the various starters and disconnecting switches are all of the "ironclad," fully protected type, mounted on steel panels fabricated at the refinery to standard dimensions. This grouping of controls has resulted in more frequent inspections, lower maintenance costs and fewer interruptions to machine operation. All motor starters now purchased are of the automatic type, but old manual starters are being retained as long as they prove useful.



Automatic contol of raw sugar washers

Special Applications and Controls

The raw sugar washing station, as shown by one of the accompanying illustrations, consists of a group of 22 centrifugal sugar washers, each driven by a Westinghouse 30-hp. high-torque motor. The motors are directly connected to centrifugal baskets by centrifugal clutches that engage after the motor has partly come up to speed, the motor itself being thrown directly across the line by means of a magnetic contactor. Each centrifugal is automatically controlled by a three-dial, motor-driven supervising relay (illustrated) which is energized by the same push-button that is used to con-

trol the starting contactor of the 30-hp. motor. Each timing dial of this supervising relay can be independently adjusted and automatically set to:

First—Control the time of admission and duration of the water spray applied to each centrifugal.

Second—Control syrup stream by which first washings of low purity are separated from final washings.

Third—Open the magnetic contactor to the 30-hp. motor and apply the brakes to the centrifugal basket.

In addition to these automatic operations there are five push buttons, as indicated on the accompanying control diagram of the automatic sugar washer. Each of these push buttons gives independent manual control without in any way interfering with the operation of the supervising relay, as follows:

Push Button No. 1—Releases the brake, closes the magnetic switch controlling the centrifugal motor and energizes the supervising relay.

Push Button No. 4—Operates the water spray independent of the supervising relay in order to wet the centrifugal basket preparatory to filling with "magma."

Push Button No. 3—Opens the magnetic contactor to the main motor without disturbing the time cycle of the supervising relay. This feature is necessary in order that the centrifugal basket may be slowed down when loaded too rapidly.

Push Button No. 1—Must be pushed again to reconnect the main motor.

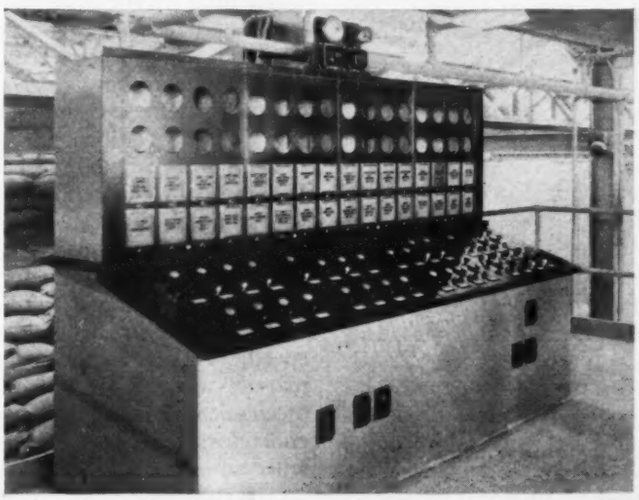
Push Button No. 2—Disconnects the main motor and applies the brake independent of the supervising relay.

Key Switch No. 5—Is for the purpose of by-passing the supervising relay and permits the operation of the centrifugals by hand control. This is necessary in making mechanical adjustment and for washing down the equipment.

The equipment described above was all designed by the engineering department of the California & Hawaiian Sugar Refining Corporation and gives an extremely flexible control of the raw sugar station. Labor charges have been reduced, a more uniform product secured and, through a better timing of operations, higher load factor has resulted at this important refinery station. It is obvious that such a control system could be applied to the washing of salt or any other product that is centrifugally separated.

One of two automatic bag-filling and weighing machines designed and built by the engineering department of the sugar company during the past season is shown in one of the accompanying illustrations. The application consists essentially of two conveyors. One, commonly called the "merry-go-round," has been in use for several years and consists merely of a succession of small platforms upon which filled bags of sugar are conveyed from the automatic weighing scales, past the sewing machine heads, to the warehouse conveyor chute. The other conveyor is suspended directly over a part of the "merry-go-round" and operates in synchronism. This second conveyor comprises a series of special hoppers, to which empty bags are attached, and which carry the bags under the automatic weighing scales. Here the weight of sugar depresses a given bag until it rests upon one step of the "merry-go-round"; the bag is released automatically from its hopper and is carried on, as indicated above.

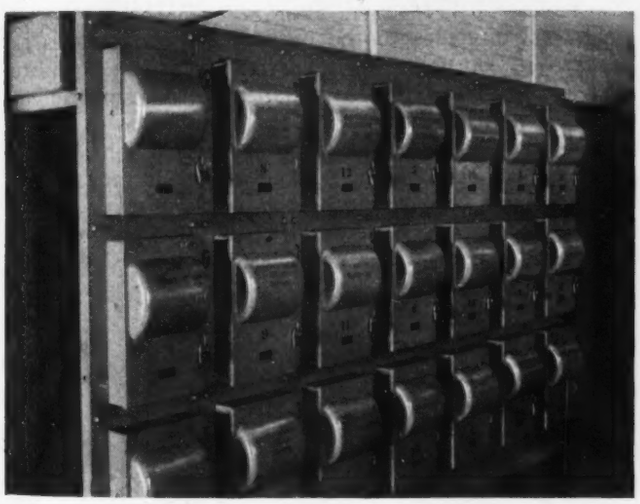
The automatic electric control of this station, as shown

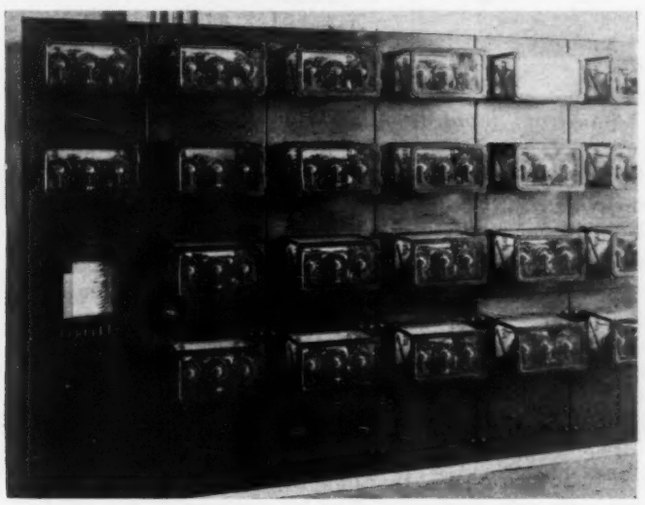


At right—Benchboard with visual annunciator for remote control of warehouse motors

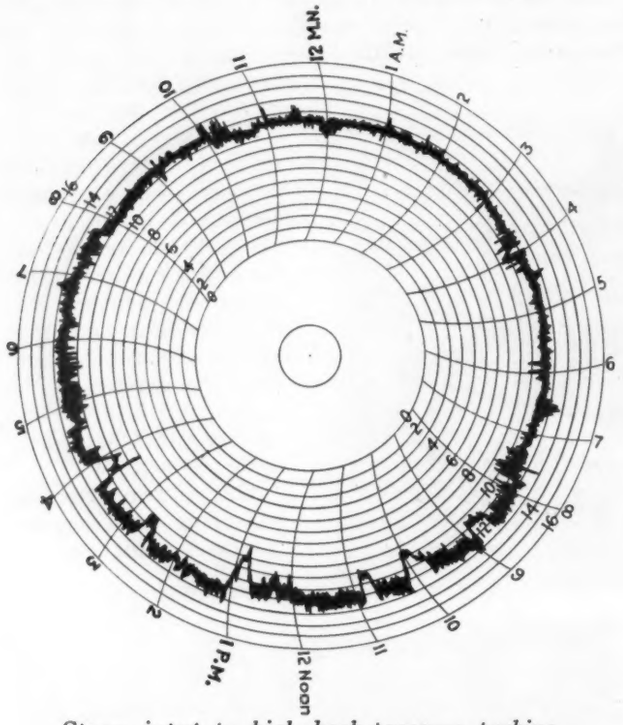
Below, left—Fabricated steel switchboards controlling distribution circuits

Below, right—Switchboard with automatic supervising relays for controlling raw sugar washers





in an accompanying diagram, consists of two separate circuits. Circuit "A," or the bag-holding circuit, consists of two copper bus bars mounted concentrically on the hopper conveyor framework. Within each hopper is mounted an electromagnet which operates holding arms, as shown in one of the illustrations, and clasps the bag to the hopper. These magnets are connected to



Steam input to high back-pressure turbine

the busbars by sliding copper brushes. The busbar is divided into sections, so that when an empty bag is slipped over the hopper spout by the operator the magnet is energized at 110 volts by means of a momentary contact switch closed by the knee of the operator. As soon as the bag has moved past this "loading section" of the busbar it is held in place by reduced voltage to minimize heating of the magnets, which are necessarily small so as not to interfere with the flow of sugar from the scale to the sack within the predetermined time.

The second circuit, "B," consists of an electromagnet control on the dumping valve of the automatic weighing scales. This circuit is equipped with a timing commutator mechanically driven by the "merry-go-round" and so arranged that the automatic scales discharge at the exact moment the proper bag is beneath them.

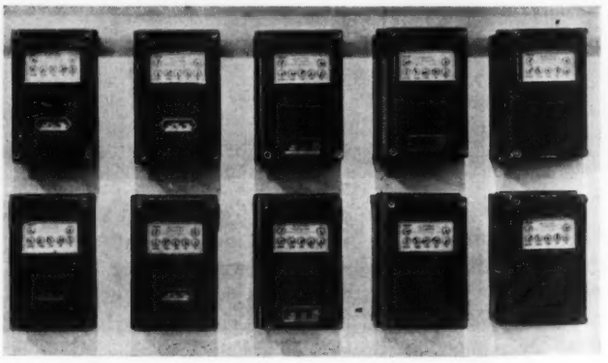
From this point the bag rests on one step of the "merry-go-round," where it first passes a tapping device to settle the sugar, and then contacts with a mechanical arm which de-energizes the bag-holding magnet and permits the bag to continue past the sewing machine heads. The installation has now been in operation for a period of six months and has not only operated with high economy but has been of still greater value in synchronizing refinery operations to a finer degree of accuracy.

As this refinery handles over its main conveying system approximately 40,000 bags of raw sugar per day from the warehouse to the refinery, and about the same number of bags of refined sugar from refinery to warehouse, it became highly important that a dependable counter be developed which would accurately tabulate this product so that the warehouse operation and the refining processes could be successfully synchronized. To accomplish this purpose it was essential that the measuring must be done at a number of points throughout the refinery and warehouse,, some of them over 1,000 ft. distant from the control station, corresponding to the load dispatcher's desk in an electric utility. Failing to find a satisfactory counting device on the market, the refinery engineers painstakingly experimented with various methods and finally developed a device which is an adaptation of the principle of an electrical demand indicator and records bags of sugar instead of kilowatts of demand. It has a recording capacity up to 10,000,000 bags of sugar before reverting to zero. A battery of fourteen of these counters is shown in one of the accompanying illustrations.

Specially designed mechanical contacting switches were developed by the refinery engineers and located at various points in the conveying system where the sugar goes down an incline, thus securing a very rapid operation of the contact. The contactor had to be made very rugged and with exceptionally high speed action in order to catch bags traveling in various positions and at various rates of speed. This contactor opens against the action of a small magnet which is installed to prevent chattering due to mechanical rebound at the time the trigger resets. These contactors have been in operation for about four years with an extremely creditable record of reliability.

Remote-Control Warehouse Switchboard

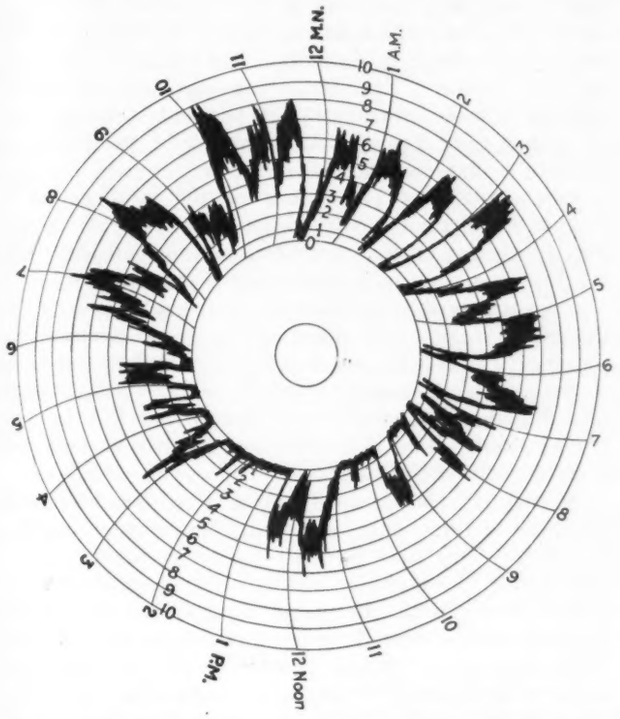
The sugar comes to the refinery in ship cargoes as large as 14,000 tons, and a very intricate and complete conveying system has been installed so that ships might be unloaded with the least delay. In addition to taking care of the unloading of the ships, 2,500 tons of the product must be delivered to, and almost as much again received from, the refinery each working day. Some 30-odd motors are employed in driving these various conveyors, a number of which are reversing and many



Remotely controlled bag counters located at central control point

of which are interconnected for various transfers of product to and from storage. As the warehouses are more than 1,000 ft. long and 250 ft. wide, divided by fire wall sections, it became highly important that all conveyor operations be synchronized from a single point. This point was selected at the end of the main conveyors which lead from the warehouse to the refinery. The first design developed was a fully automatic type, using plugs and receptacles so that any train of conveyors could be

electrically interlocked. This design was rejected for two reasons: (1) Due to the excessive number of combinations needed to satisfy all of the requirements in transferring product. (2) Due to the fact that it would introduce too much special equipment and thus complicate the maintenance problem. It was deemed wiser to design a remote-control board, giving individual control



Input of make-up steam to refinery vacuum pans as delivered from boiler room to "Shield" regulating valve

of motor circuits without interlocking, and to use types of control equipment familiar to the operating department.

A benchboard was designed, as illustrated, to give rapid remote control over all of these motors in order that jams on the conveyor systems could be prevented and that transfers of product could be quickly and accurately carried out. The benchboard, which is of General Electric manufacture, is designed along central-station lines, except that 440-volt control equipment is used instead of the conventional 110-volt. Multi-conductor No. 14 B. & S. gage wire is used between the benchboard and the automatic motor starters and contactors in various sections of the warehouse. Three wires are used to control an ordinary operation and five wires are used to control a reversing operation.

Conventional red and green bull's-eye lamps with red and green mechanical indicators are used on each control switch, the lamps having a 440-volt resistor between them and the source of energy. In addition to these lamps on the benchboard, there is a ground glass visual annunciator mounted on the vertical section of the switchboard. If a motor stops, due to overload, no voltage or from any accidental cause, a white light flashes behind the ground glass annunciator and illuminates the painted name or number of the conveyor, and at the same time an auxiliary gong in parallel with the white light is sounded. The operator then manually disconnects all motors that are driving conveyors in train with the conveyor in trouble. A pull on the green or stop button of the troubled conveyor clears the white light and bell by means of an auxiliary finger.

Operated in conjunction with this system of control is a 12-volt direct-current signal system with return call push buttons and bell. The bell on this system is connected in parallel with a red lamp mounted back of the ground glass visual annunciator which flashes the name of the conveyor whenever a signal comes in. Reset buttons are mounted on the switchboard for clearing this light after the operator has heard the signal and identified the conveyor.

All motors are normally started and stopped on bell signal from the motor station, and emergency stops are made at the benchboard whenever a motor kicks out in a conveyor train. Safety buttons are also installed at convenient points near the motors and conveyors so that emergency stops can be made when necessary.

This switchboard has proved highly satisfactory in expediting warehouse operations and in cutting down the losses incidental to jams that previously occurred when a single conveyor, operated in train, fell out of step. It is planned, as will be seen from the accompanying illustration, to install ammeters in each motor circuit so that the operator on the benchboard will have continuous knowledge of the loading and operating condition of each conveyor in the system.

In conclusion, it is only fair to point out that the achievements of the engineering department of the California & Hawaiian refinery in these advanced applications of electricity were all made in the face of many discouraging circumstances, among which may be cited the tremendous pressure required by the routine operation of such a large plant, and, secondly, due to the fact that very little, if any, standard equipment could be applied to the work in hand, especially as the refinery is situated several thousand miles from the great manufacturing centers of the electrical industry. Under these circumstances the important and successful applications made could only have been carried out by engineers of an enthusiastic type, and above all by engineers who were "electrically minded."

Cost of Steam Plant Equipment

FROM the data sheets of a large steam-driven central station the following field installed costs, excluding general job and contractor's compensation and overhead, are taken as of 1927:

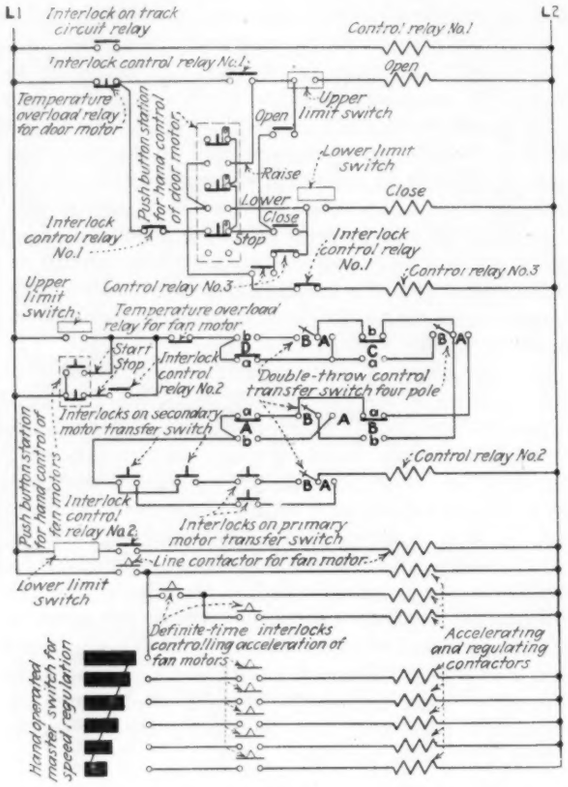
STEAM PLANT EQUIPMENT COSTS, 1927

One Ingersoll-Rand two-stage, horizontal type 10, water-cooled, 12x12-in. air compressor, 60-in. flywheel, 10x8-in.x15-ft. long leather belt and 50-hp. motor, 2,200-volt, three-phase motor	$4,512
One air compressor, Kellogg self-contained, chain-driven model 42-250, 1-hp. motor, 110 volts	358
One air compressor, Westinghouse air brake locomotive type, 6x12x10-in.; steam end, 8x12x10-in.; air end, 2-in. steam outlet, 1¼-in. steam inlet	522
One 1,000-gal.-per-minute centrifugal fire pump. 1,650 r.p.m., 8-in. suction, 6-in. discharge, direct-connected to Westinghouse turbine, single-stage impulse, 200-lb. gage, 100 deg. superheat	4,342
One 3,500-kw., 100 per cent power factor turbo-generator unit, 1,800 r.p.m., 180 lb. steam pressure, 20 deg. superheat; generator 2,300 volts, three phase, 60 cycles, with oil pumps for turbine	71,886
One jet condenser, Westinghouse LeBlanc, turbine driven, handling 2,380,000 lb. of water condensing 58,450 lb. steam per hour to 28-in. vacuum with cooling water at 40 deg. to 70 deg. F.; one centrifugal pump driven by 15-hp. motor, and one 5,240 gal.-per-minute centrifugal condensate ejector pump, one vacuum air pump and one 143-hp. turbine (non-condensing), 1,000 r.p.m.	12,333
Pedestal and foundation	2,951

Ventilation Control in the Moffat Tunnel

By H. C. Glaze and M. P. Bailey
General Electric Company

FAN ventilation is used by the Denver & Salt Lake Railroad in removing smoke and gases from the recently completed Moffat Tunnel through the Continental Divide in Colorado. All ventilation is accomplished at the east portal through the use of two fans



Control plan for ventilating fans and dampers

located in separate compartments of a specially designed structure. Control equipment is installed in this building.

Each fan is driven by a 2,200-volt, slip-ring, induction motor. As the barometric pressure varies considerably between the two portals during different seasons of the year, motors of different capacities are used, one of 750 and the other of 500-hp. Only one fan is operated at a time, the selection depending on the traffic and the barometric pressure. The speed of each motor may be reduced 20 to 25 per cent by means of a resistor.

A door installed in the tunnel at the east portal confines and directs the air in the tunnel. This door in opening slides upward and is actuated by a 10-hp., high-resistance, squirrel-cage motor.

Under certain conditions fresh air is forced through the tunnel from east to west, while under other conditions the smoke and gases are exhausted from the tunnel from west to east. The fan rotates in but one direction, dampers being provided to change the direction of air flow and to control the several openings. By suitably adjusting these dampers the air can be forced into or discharged from the tunnel.

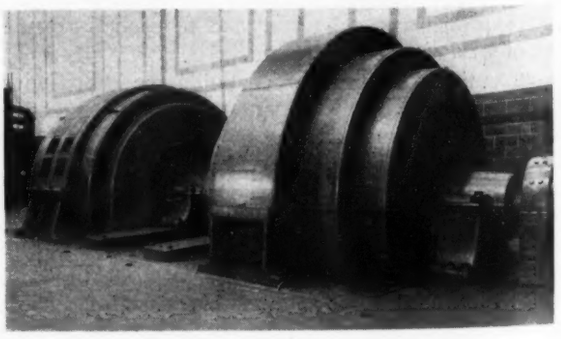
As a train approaches the tunnel from the east it closes a track circuit, thus causing a track relay to energize a reversing magnetic starting switch. This switch opens the tunnel door by means of the 10-hp., squirrel-cage motor previously mentioned, and allows the train to enter the tunnel. As the last car leaves the track circuit the relays drop out, energizing the "close" contactor of the magnetic starting switch. When the door reaches the closed position a limit switch trips, completing a circuit for a contactor, which in turn closes a triple-pole, 300-amp., high-voltage, oil-immersed line contactor governing the fan motor. The latter automatically accelerates through suitable contactors to 80 per cent speed by means of definite-time control. Any increase in speed above 80 per cent is obtained by means of a master switch. When a westbound train passes out of the west portal the conductor telephones the station attendant at the east portal, who, if traffic conditions permit, can shut down the fan by means of a push-button station.

A train approaching from the west makes contact with the track circuit inside the tunnel at some distance from the door, causing the track relay to complete the circuit to the reversing magnetic switch. The various devices then function in a manner similar to that for the westbound train. The door may be opened at any time, from a push-button station.

As the railroad company intends to operate but one motor at a time, only one control equipment has been installed. This may be used for either motor and includes one three-phase, 2,200-volt, incoming line and feeder panel with the usual instruments and circuit breaker with overload and undervoltage trip; a speed regulating starter panel, containing the necessary secondary accelerating contactors, regulating contactors, accelerating and control relays, as well as the necessary push-button stations, limit switches for the tunnel door, and a master switch. On the secondary panel there is a reversing magnetic switch for controlling the 10-hp., 220-volt, squirrel-cage motor operating the door at the east portal.

Each of the dampers is controlled by a 3-hp., 220-volt motor operating a suitable mechanism. They are interlocked in such a way that the fan motors cannot operate until proper dampers are completely opened or closed, as the case may be.

40,000-Kw. Frequency Changer Ties 25- and 60-Cycle Systems in New York



40,000-kw., 25/60-cycle frequency changer set tying the East River generating station of the New York Edison Company with the Brooklyn Edison Company and the United Electric Light & Power Company.

Engineering for Economy*

Objectives for action outlined. Planned development. More research. Better personnel. Broader perspectives. Economic approach

By E. C. STONE
Chairman Engineering National Section, N.E.L.A.

UNTIL a very few years ago the leaders of our industry were primarily concerned with reducing the cost of energy. Much success has been attained in this line, and the cost of energy has now become such a small part of the total cost that it is necessary to look elsewhere in the future for major economies. On the other hand, the tendency to build large power plants at points more and more remote from the load centers, involving more extensive transmission systems, and the insistent demands for greater and greater reliability of service, as well as other less important influences, are giving the unit cost of system investment an upward trend. This fact and the vast reductions that have been made in unit fuel cost are making the fixed charges on system investment an element of constantly increasing importance in the overall cost of electric energy delivered to the user. The system investment is therefore the most logical place to look for further cost reductions.

The executive committee of the Engineering National Section has adopted the following major objectives toward which the work of the section should be directed:

More kilowatt-hours per kilowatt of system capacity.

More system capacity per dollar of investment.

Definite advance planning of system development, and co-ordination of adjacent systems.

Comprehensive research in fundamental engineering problems of the industry, co-ordinated through the committees.

Better content and wider distribution of serial reports.

Study of, and when desirable, reports on national engineering issues affecting our industry.

Constructive co-operation in the national movement for standardization.

Greater engineering service to the industry through closer co-operation with the other national sections of the N.E.L.A.

Recruiting and training of adequate engineering personnel.

The first objective, to obtain "more kilowatt-hours per kilowatt of system capacity," is primarily a sales job, but the engineer can and should make a definite and valuable contribution. Getting more kilowatt-hours per kilowatt of system capacity means an intensive development, requiring that power be furnished at lower than average prices for new uses and under conditions different from those we are familiar with. Attainment of maximum results will necessitate a thorough and accurate knowledge of the cost of service in each case. It is clearly the engineer's problem to determine cost of service, involving, as it does, an analysis of load factors and diversity of demand, investment required to serve, and so on, and he should make a careful study of the cost of serving each new class of business that comes up for consideration.

It is the function of the engineer to set up the engineering features of the service extension and installation rules. In many cases these have become very complicated and cumbersome and include requirements entirely unnecessary under conditions now existing. At this time the engineer can very properly review this entire situation with the purpose of simplifying the physical conditions under which service is rendered and thereby improving our relations with our customers.

The second objective, "more system capacity per dollar of investment," is the engineer's own problem. There appear to be particularly three methods of approach to this objective, as follows: Development of best practices in engineering through the activities of the engineering committees of the N.E.L.A.; definite planning of system development; research both in system designing and operation and in apparatus and equipment.

The advantages in planning system development where growth is as rapid as in our industry are self-evident, but have not been fully appreciated until quite recently. Comprehensive planning will include a study of the probable future load conditions in the territory served and an analysis of the earning power of the different parts of the system; it will determine the economic steps by which to increase capacity and the proper time at which to make additions to the system; it will determine proper proportioning of steam and hydro-electric generating capacity, useful interconnections and co-ordinated development of adjacent systems; it will bring out new operating problems to be encountered in future conditions of load and system capacity, thus permitting a thorough study and solution before they become acute, and it will make it possible for the engineer to keep his executives fully informed in advance as to financial requirements for system development and probable engineering and operating difficulties to be encountered as the load grows.

**Abstract of address presented at the annual convention of the Southwestern Division, N.E.L.A., Biloxi, Miss., April 3, 1928.*

Research in apparatus and equipment is of course primarily the job of the manufacturer. Nevertheless, the manufacturer cannot furnish adequate equipment unless the power engineer defines the conditions which must be met in operation, and the power engineer must co-operate in testing and trying out under operating conditions new developments in equipment which give promise. For example, circuit-breaker tests on actual power systems have been an invaluable aid in improving circuit breakers. Similarly, recent tests of transient conditions on transmission systems have furnished data most vital to efficient design of systems and equipment.

Economy in Expenditures

The power industry will undoubtedly spend more money both for operations and for additions to plant during the next ten years than it has spent in any previous like period of time. In capital improvements alone it is quite reasonable to suppose that as much as ten billion dollars will be spent. The engineers will be responsible for specifying how these huge sums are to be expended. Furthermore, the exacting demands for the highest possible grade of service and the economic pressure to get the greatest possible value out of every dollar spent, as well as the more intricate engineering problems coming from the enormous amounts of energy to be handled and the vast networks of transmission and distribution required to handle it, will make the engineering problems of the future more complex than those of the past, so that both the magnitude and intricacies of the situation will make it necessary that particular attention be given to the recruiting and training of an adequate engineering personnel to handle them.

The knowledge now available on the engineering problems of the power industry, if utilized by engineering talent of high grade, should make possible a future development far more consistent than that of the past, with a correspondingly lower unit cost of plant and of replacements for obsolescence. A more systematic development, based on better understanding of the problems of the future, will prove adequate to meet the conditions imposed by more exacting service requirements, greater economic pressure and larger volumes of energy to be handled.

New Type of Engineer Needed

I believe it is fair to say that at the moment there is considerable opportunity for improvement in the organization of the engineering forces of member companies and in the quality of engineering achievement. In the past many engineers of above the average in ability have been diverted to executive positions because of the greater necessity of filling such positions effectively, with the result that there is a shortage of high grade engineering talent in our industry. This means that more attention should be given to bringing the best engineering graduates into the industry and more interest should be taken in the courses given in the engineering schools, in order that the graduates may be better fitted for the work they are to perform.

The development of the huge power systems now in operation and growing at a rapid pace have changed the character of engineering talent required. Whereas not so many years ago the power system engineer was confronted mainly with the details of making the different pieces of apparatus work, he now faces the far broader problems of developing a co-ordinated system that will deliver an even higher quality of service than has been accomplished in the past and will show the greatest possible return for every dollar spent.

The job of the power system engineer today starts, of course, with getting solutions to his physical problems, but it by no means ends there. Following the solution of the physical problem there must be an economic analysis of each situation, including comparison of the present and future capital requirements, annual over-all costs, both in operating expense and fixed charges on investment over a period of years; extent of replacement of existing equipment in each case and justification therefor, accuracy of the assumptions made and possible effect on results as actual conditions develop that are at variance with them. The situation must be studied from the executive, commercial and public relations viewpoints, so that the engineer must go beyond the realm of the scientific into that of the business man. And just to the extent that he is able to understand and anticipate the executive's judgment as drawn from all of these viewpoints, to exactly that extent does he become a more valuable man and put himself in line for bigger things.

Conclusion

In conclusion, it is desired to leave two thoughts for consideration:

1. The industry will spend more money in the next ten years than in any past like period. It will be called upon to meet more exacting service requirements than ever before, and will be under greater economic pressure so that more careful attention will have to be given to every dollar spent. These are the engineer's problems and they are more difficult than those which have confronted him in the past. There is, therefore, an important executive problem to be worked out in recruiting and training the necessary engineering talent and in providing an organization to enable it to function adequately.

2. To meet these more exacting requirements the engineer must be developed into a "scientific business man." His job starts with getting solutions to physical problems, but it by no means ends there. He must be a good business man, a salesman, a diplomat and "must play with the teams" if he is to deal successfully with those men with whom he must deal if his plans are to materialize. Just to the extent to which the engineer understands and anticipates the executive judgment, which must be based on organization, commercial and public relations viewpoints, as well as on engineering, to exactly that extent does he become a more valuable man to his company.

Ovens Found Best for Drying Electrical Apparatus

By T. A. Converse
Local Manager American Electric Service & Maintenance Company, Troy, N. Y.

EXPERIENCE indicates that in drying out water-soaked motors, control apparatus, etc., the work should be done by baking and redipping in preference to drying out by electric current circulated through the windings, except where emergencies preclude the oven method. Our tests show that when dried out internally by heating up the windings through current application there is a tendency to char the insulation and to cause deterioration of the external insulation on the coils. We have also found it necessary to redip the winding in insulation varnish to bring it back to the standards that existed before the winding was damaged.

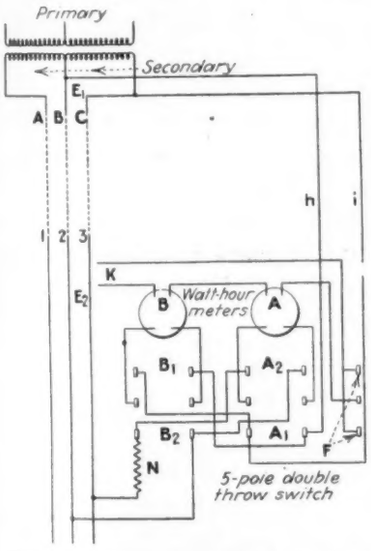
In the late Vermont flood we had a variety of apparatus to dry out, including both alternating and direct-current motors, transformers and other equipment. Our method was the same in all cases, that is, the apparatus was disassembled and the windings were placed in an oven and baked for 72 hours at 250 deg. F. The apparatus was then tested for breakdown and resistance, and if in good condition the coils were dipped in varnish and the apparatus rebaked at the same temperature for 48 hours. This method was entirely satisfactory and we believe that if the apparatus to be dried is not too large it pays to follow this plan rather than to dry out by excess currents and finish with surface coats of varnish.

Errors from Potential Transformer Leads

By G. A. Collins

San Joaquin Light & Power Corporation, Fresno, Calif.

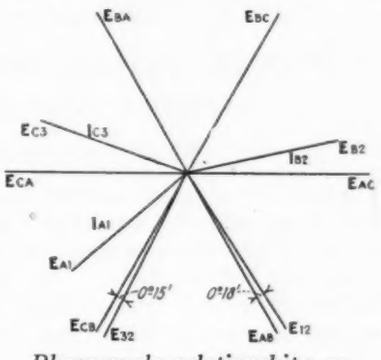
LONG leads in the secondaries of potential transformers, unless the size of conductor is larger than ordinarily used, introduce appreciable errors in the registration of watt-hour meters. With a secondary burden consisting of two watt-hour meters and a directional relay potential coil a 300-ft. run of 19-25 stranded cable will introduce a phase shift of between fifteen and twenty minutes. This phase angle, in the case of an inductive secondary burden on the potential transformer, is in the same direction as the phase angle of the potential transformer and the two add in their effect on the accuracy of the watt-hour meters. If in addition to the two watt-hour meters and relay potential coil a non-inductive burden of the order of 200 volt-amperes is added to one of the phases its potential will be lowered about 2 per cent and that of the other phase raised somewhat. In this case considerable error is introduced by the voltage drop and there is also an appreciable phase shift.



Wiring arrangements for measuring potential drop and phase angle of leads

N is a resistance equal to that of the leads *h* and *i* from the potential transformers to the switchboard. *K* is a source of current for the series elements of the two watt-hour meters.

The watt-hour meter method of testing instrument transformers can readily be adapted to measuring the phase angle and potential drop in the secondary leads of potential transformers. The accompanying wiring diagram indicates the connections for measuring the potential drop and phase angle of leads *B*-2 and *C*-3 for phase *BC*. The resistance and reactance of the leads *h* and *i* should be kept low by using a good-sized conductor, about No. 10, and twisting or tying the two together. The two jaws, *F*, of the double-throw switch are shorter than the others, so that the current circuit, *K*, is opened in advance of the two potential circuits. This eliminates any error that would result if the two potential circuits did not open or close at exactly the same instant owing to slight differences in the lengths of the potential switch jaws.



Phase-angle relationships as determined in test

With the current in the series coils of the watt-hour meters in phase with the potential *BC*, two sets of readings are taken; first, with the switch in the position $A_1\ B_2$, the revolutions of the meters *A* and *B* being designated A_1 and B_2, respectively, and, second, with the switch in the position $A_2\ B_1$, the revolutions of *A* and *B* being designated A_2 and B_1. Then

$$\frac{E_1}{E_2} = \sqrt{\frac{A_1\ B_1}{A_2\ B_2}}$$

which is the ratio of the voltage at the transformer terminals to that at the switchboard.

To get the phase difference of E_1 and E_2, the current in the series coils of the watt-hour meters is made to lag behind the potential *BC* and another set of readings is taken, from which

$$\cos\ (\theta + \alpha) = \cos\ \theta\ \frac{E_1}{E_2}\ \sqrt{\frac{A_2\ B_2}{A_1\ B_1}}$$

θ is the angle by which the current in the series coils of the meters lags behind the potential *BC*, $\frac{E_1}{E_2}$ is the ratio, found in the first test, of the voltage at the transformer terminals to that at the switchboard, A_1, A_2, B_1, B_2 are the readings of the two watt-hour meters and α is the difference in phase between E_1 and E_2. This form of the phase angle formula is convenient for logarithmic calculation and leaves no question as to the sign of α, or need of further tests to determine it. E_2 leads E_1 if the sign of α is positive.

To check the accuracy of the method a set-up was made, $\frac{E_1}{E_2}$ and α determined by the watt-hour meter method of test and the results checked by calculation. The burden across each of the two phases (1-2 and 2-3) consisted of two watt-hour meters and a directional relay potential coil. The resistance of the lead *A*-1 was 0.479 ohm; *B*-2, 0.492 ohm, and *C*-3, 0.472 ohm. The current in leg *C*-3 was 0.463 amp. and lagged 79 deg. 45 minutes behind potential E_{CB}. The current in leg A-1 was 0.518 amp. and lagged 79 deg. and 17 minutes behind potential

COMPARISON OF RESULTS OBTAINED BY TEST AND CALCULATION

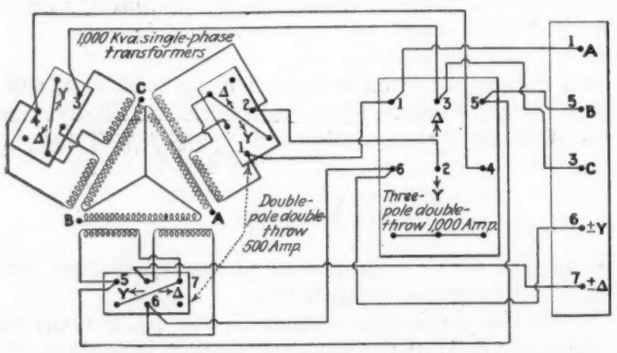
	Phase Angle		$\frac{E_1}{E_2}$	
	Phase *AB*, Minutes	Phase *CB*, Minutes	Phase *AB*	Phase *CB*
By test	+19	+18	0.9990	1.0023
By calculation	+18	+15	0.9993	1.0026

E_{AB}. The phase sequence was *CBA*, potential *AB* leading potential *CA* 120 deg., and potential *CA* leading *BC* 120 deg. Both phase voltages *AB* and *BC* were 120.5.

Portable Transformer Bank Aids System Changeover

By Maurice D. Smith

DURING a recent system changeover from delta to Y secondaries it was often found necessary to install a bank of transformers temporarily in order to boost the voltage at certain points. The transformers were installed either on a pole or in an inclosure and were in service for only a short time, the period of operation



Transformer bank permits rapid shift from delta to Y secondary distribution system

varying from three days to a week, depending upon the amount of related work to be done on the distribution circuits and at the customer's premises.

In order to provide continuous and adequate service, it was felt that the expenditure was justified, but that the time required to install, dismantle and shift it to a new location had a tendency to retard the changeover progress. The possibility of using a bank of transformers permanently installed on a trailer was then studied and it was found to be the most economical and convenient means of supplying emergency and temporary service.

A 2-ton, completely inclosed electric truck which had been in service for many years and was to be retired was converted into a trailer at a small expense. It was equipped with three 100-kva., single-phase transformers connected as shown in the accompanying illustration and offered a flexible outfit. The primary cables enter the trailer through the roof, going first to a set of primary cutouts, which are fused for 100 amp. each, and then to the transformers. A pothead is installed in the primary neutral so that the neutral may be opened for the closed delta connection and closed for the Y connection. By throwing three two-pole and one three-pole, double-throw switches either a delta or a Y connection can be made. Conductors of 800,000-circ.mil cable are brought from the transformers to the switches and from the switches to a terminal board. Here the cables to the network, which enter the trailer through the floor, may be shifted either to the delta or to the Y connection in a short time. A color scheme is used to mark the delta and Y connections in order to prevent the operator from making a false connection. This arrangement so speeded up the work that it enabled the completion of a large project ahead of schedule.

Computing Compensator Settings for Automatic Regulators

FIRST ARTICLE

By V. W. Palen

IT IS the author's purpose to outline quite completely in this series of papers, of which there are five, the steps in the method used by an Eastern electric company for obtaining compensator settings for its voltage regulators. The engineering division of this particular company supplies the operating division with such computed settings in advance of all major feeder changes. In relatively few cases has it been necessary to substitute experimental settings for the theoretical ones computed beforehand.

Take the case of a single feed. The load center is located quite definitely through a careful study of the maps showing all of the transformers supplied from the primary in question. Once the load center location is determined, the resistance, reactance and impedance of the primary from substation to load center must be computed.

CHARACTERISTICS OF UNIT LENGTHS OF CONDUCTORS

Type of Primary	Ohms Resistance	Ohms Reactance	Ohms Impedance
1,000 ft. of 350,000-circ.mil underground cable	0.0345	0.0369	0.0580
1,000 ft. of 250,000-circ.mil underground cable	0.0431	0.0379	0.0570
1,000 ft. of No. 2/0 overhead wire	0.0790	0.1320	0.1540

In the case given in the accompanying illustration the load center is 4,000 ft. from the substation. Using the data in the accompanying table the resistance, reactance and impedance from substation to the load center are as follows:

		Ohms Resistance	Ohms Reactance	Ohms Impedance
(AB)	1,000 ft. of 250,000-circ.mil. underground cable	0.0431	0.0379	0.0570
(BC)	3,000 ft. of No. 2/0 overhead wire	0.2370	0.3960	0.4620
(AC)	Total	0.2801	0.4339	0.5190

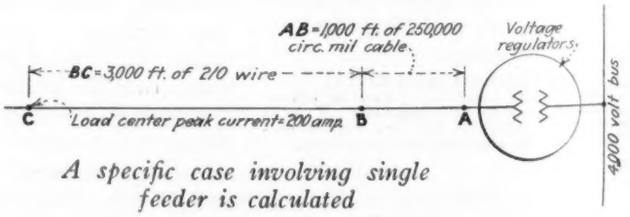
Since the primary current at peak load is 200 amp. and since the ratio of the current transformer is usually 20 to 1:

$$\text{Resistance Drop (AC)} = \frac{0.2801 \times 200}{20} = 2.801 \text{ volts}$$

$$\text{Reactance Drop (AC)} = \frac{0.4339 \times 200}{20} = 4.339 \text{ volts}$$

$$\text{Impedance Drop (AC)} = \frac{0.5190 \times 200}{20} = 5.190 \text{ volts}$$

The compensator on this feeder, therefore, is set as nearly to the values above as is possible.



A specific case involving single feeder is calculated

In the papers to follow the author will take up the computations for single-loop, double-loop and triple-loop circuits. In the last paper of the series various types of compensators and methods of applying definite settings to each will be described.

Low-Cost Rural Construction

Lightweight X-frames, utilized to provide service at minimum cost, prove practical. Single-phase rural lines constructed for $333 per mile

By George W. Kable
Agricultural Engineer

A FLEXIBLE, scissors-like frame made of 2x4-in. timbers and hinged at the base to 1-in. iron pipes set in concrete blocks replaces the customary pole in an unusual type of 2,200-volt rural line construction used by the Young Electric Company near Sherwood, Ore. This type of support makes possible the construction of a single-phase rural line at a cost of $333 per mile.

Erecting one of the X-frames after wires are tied in and installing the pre-cast concrete footings

It was evolved by D. S. Young five or six years ago and is not entirely an untried experiment, one such line having been in service for more than four years. Some of the advantages claimed for the line are: 50 per cent reduction in farm line construction and maintenance cost; a safe line complying with regulations; no pole climbing; a two-man line crew at farm wages; no rotting off of poles, and no guy wires crossing roads.

The owner and manager of the Young Electric Company is a farmer. Six years ago he purchased about 6 miles of rural distribution line having a bad financial reputation and threatened with paralysis. In endeavoring to maintain and extend his lines and give reasonably good service, the owner was forced to measures of economy that have stimulated originality. For instance, he reads meters once every three months, presents the bill on the spot, discusses any difficulties or contemplated equipment the user may have in mind, and in 90 per cent of the cases collects the bill. The meter book, including detachable bill form, comprises the entire bookkeeping system. These economy measures, including the flexible frame line construction, have resulted in reductions in first cost and overhead sufficient to permit service in territory which under a more costly system would probably be without electricity for many years.

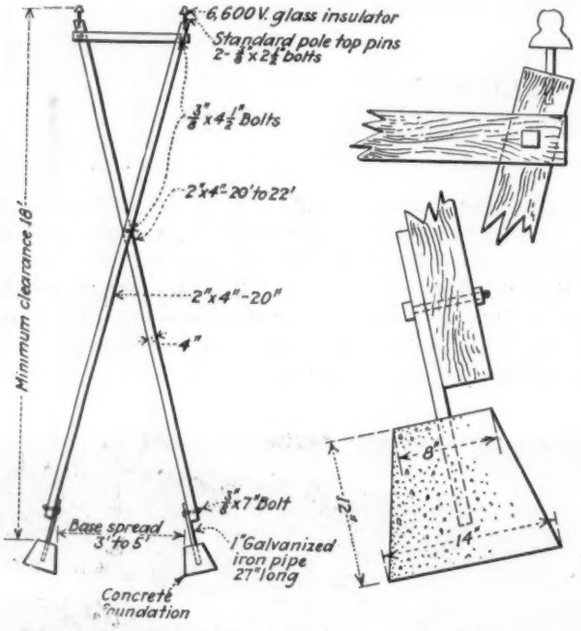
All of the distribution lines of the company are single-phase, 2,200 volts. The system at present consists of two separate units embracing 8 miles of pole line and 11½ miles of flexible frame construction. Power is purchased from two different companies and distributed to a total of 90 customers, mostly farmers. Sixty per cent of the load is lighting.

The distinguishing feature of the flexible line is the frame. Intermediate frames are made up of two 2x4's, and anchor frames of 3x4's bolted together near their centers with ⅜-in. bolts. A cross-member is bolted near the top as shown in the accompanying illustrations. The frame is bolted to two 1-in. iron pipes embedded in pre-cast pyramidal concrete blocks. Anchor frames are placed at intervals of about one-quarter mile, at road or line crossings, where transformers are hung and at points where the line changes direction. Frames are anchored to concrete dead-men through anchor rods, strain insulators and ¼-in. guy cable attached to the frame cross-member near the top.

There are no lateral guys on the frames. On slight curves the frames are stiffened by vertical tension members which carry the side pull to the foundation blocks. On sharper curves a third anchor block is used, causing the resultant forces to still fall within the base of the frame and make it self-supporting. Where service leads

run from a frame, the transformer is hung to one side of the center of the cross-member to balance the pull of the service wires. No attempt is made to place anchor blocks on the same level. On hillsides one leg of the frame may be 6 or 8 ft. longer than the other.

In erecting the line the cross-members are bolted together on the ground, the wires tied in and the frame raised in the manner shown in one of the accompanying illustrations. In this way two men will erect one-half mile of straight line completely in one day after the precast concrete base blocks have been placed and the material delivered to the job. Costs for building 9 miles of line in 1925 are given in the accompanying table.



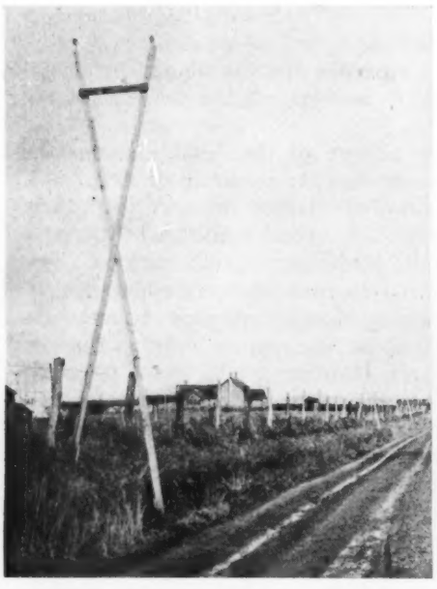
Dimensional details of X-frames for supporting 2,200-volt rural line

Mr. Young has not constructed his flexible line without criticism. At first thought the 2x4-in. frames seem dangerously flimsy and the hinged base a travesty on the creosoted pole. Such a radical change must also offend the eye of many who have grown up with pole lines. The seeming unsightliness of the frame line diminishes, however, as the novelty wears off.

The Oregon Public Service Commission, while not having passed formally upon this type of construction, has the following to say regarding it: "This type of construction was called to our attention previously through an informal complaint, and a field inspection was made by our engineering department. . . . Sections of line using this class of construction were found to be giving satisfactory service after many years. Will further advise that additional study of this matter indicates that in so far as construction requirements prescribed by this commission and contained in the Na-

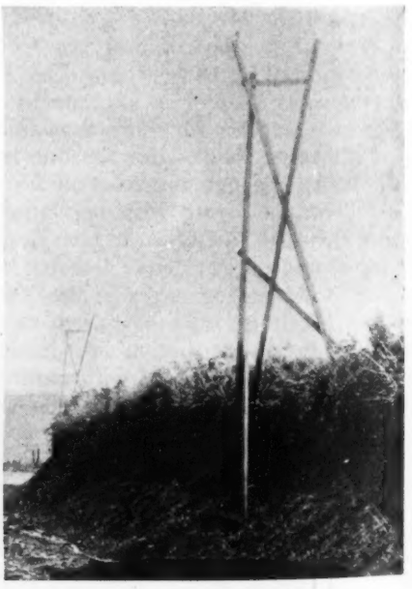
COST DATA FOR X-FRAME RURAL LINE CONSTRUCTION

Anchor rods	$51.50
Bolts	68.08
Cable	29.85
Cement	119.00
Copper (Nos. 6, 8 and 10)	887.24
Cutouts	20.00
Clevises	22.20
Gravel and sand at $2.75 per yd.	75.00
Guy clamps	41.26
Glass insulators	50.52
Eye bolts	17.15
Strain insulators	53.70
Lumber at $18, $20 and $22 per thousand	262.45
Pole top pins	120.50
Anchor pipe	169.16
Washers	16.74
Reinforcing for anchor blocks	10.00
Total	$2,014.35
Plus 10 per cent	201.43
Total material cost	$2,215.78
Total labor cost	$713.30
(Including clearing right-of-way, assembling materials, cement work at 60 cents per hour, digging anchor holes at 20 cents each, and two men erecting line at $5 and $4 per day)	
Insurance	$39.81
Freight	35.00
Total cost of line	$3,003.89
Total cost per mile of line	333.76
Material cost per mile	246.20
Labor, insurance, freight, etc., per mile	87.56
Following are total costs for individual frames erected in place and including all labor and material except that for clearing right-of-way and for copper:	
Intermediate frames	$6.00
Light turn and service drop frames	6.90
Heavy turn frames	9.00
Transformer and intermediate anchored frames	10.05
Dead-end frames	12.45
Transformer and heavy turn frames	12.75



Inexpensive rural line construction used in a farming section

Transformer structure with offset to balance service wire pull



Self-supporting angle structure using simplified design

tional Safety Code are concerned, this type of supporting structure meets all rules and regulations prescribed for rural line construction."

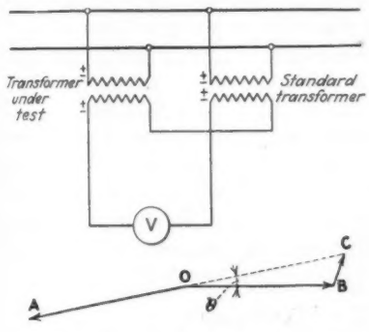
Obviously, the greatest use which the frame construction might be expected to serve would be for the secondary distribution lines and perhaps for private farm extensions where low first cost is desirable and unskilled workmen are available. At least it offers a possibility worth considering in rural line extension programs.

Measuring Instrument Transformer Characteristics

By Carl W. Evans
University Station, Tex.

IN THE cases of utilities in which the number of necessary instrument transformer tests is small it is not generally economical to purchase elaborate testing equipments for this work. To such companies the following method of checking the ratio and phase-angle characteristics of current and potential transformers will be of interest inasmuch as the only special equipment required consists of standard potential and current transformers and low-reading voltmeter and ammeter.

For testing a potential transformer the connection shown in the accompanying illustration is used. It will be observed that the voltage of one transformer is in opposition to the voltage of the other. The voltmeter, *V*, indicates the vectorial difference between the two voltages. Because all alternating - current voltmeters are of the electro-dynamometer type, the voltmeter will not indicate which of the two is the higher voltage, but this can be determined by measuring the voltage of each separately. If the voltage of each transformer and the voltage indicated by the voltmeter are plotted to scale vectorially, the result will be a closed triangle, as shown. The vector *OA* is the voltage of the standard transformer; the vector *OB* is the voltage of the unknown transformer, and *CB* is the vectorial difference of the two, which is the voltage indicated by the voltmeter. From this information it is possible to determine the characteristics of the transformer under test. If R_s is the ratio of the standard transformer, then the ratio of the transformer under test is given by the formula:



Simple ratio and phase-angle test for instrument transformers

$$R_x = R_s \frac{OB}{OA}$$

where *OB* and *OA* are the voltages, respectively, of the unknown and the standard transformer secondaries.

The phase angle of the transformer under test, as compared to the standard, is the angle between *OB* and *OA* reversed; that is, between *OB* and *OC*. Since the values of *OA*, *OB*, *OC*, and *BC* are all known, the angle may be determined very easily from the trigonometric formula:

$$\phi = \cos^{-1} \frac{OB^2 + OC^2 - CB^2}{2 \times OB \times OC}$$

In the testing of current transformers the procedure is exactly the same, the current transformer under test and the standard transformer, excited from the same primary source, being connected in such a manner that their secondary currents are in opposition and the resultant current of the two being measured by a low-reading ammeter. The same formula may be used, the only difference being that the values substituted are currents instead of voltages.

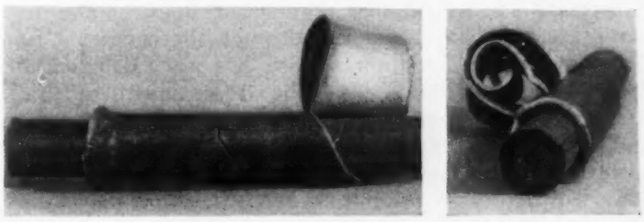
The phase angle determined by this method is the angle between the secondary voltages of the standard and the unknown transformer. It is impossible by this method to determine whether the voltage of the transformer under test lags or leads the voltage of the standard transformer, hence it is not possible to correct the values found with the correction curves usually furnished with the standard transformers. When the characteristics of the standards are very nearly ideal, as they usually are, the error introduced by not correcting the readings with the correction curves is very slight. Only where a very high degree of accuracy is required, as in laboratory measurements, will the accuracy, obtained by the expensive equipment available, justify the additional investment.

Proper Cutting of Lead Sheath Improves Cable Splicing

By John A. McHugh
Assistant Engineer New York Edison Company

IT HAS been found that in the preparation of paper-insulated, lead-covered cable for splicing two troubles arise which can easily be prevented: First, the lead is not always uniformly belled around the cable; second, the outer papers of the mill insulation are sometimes damaged, either in making the usual lateral cut through the sheath or in attempting to bell out the lead.

Both of these difficulties can be overcome by following an improved procedure for the preparation of the cable ends. A sharp knife or specially designed tool is used to scribe around the cable at the location where the lead is to be removed. A helix is then scribed from this point to the end of the cable. The lead is pierced at the outer end of the helix and grasped with pliers. By rotating the pliers in a manner similar to the operation



Helical cutting back bells cable and protects insulation

of a can opener the lead is easily removed, as is shown in the accompanying illustrations. The radial tension applied to the lead in the operation produces an appreciable belling-out of the lead, sufficient to relieve electrostatic stresses in cables for moderate transmission voltages and to permit the easy introduction of metal foil for reducing the stresses in higher voltage cables. This feature can be noted in the illustration. It may also be observed that the marker tape under the cable sheath is not disturbed.

Transmission by Cables

High-voltage cables considered as commercial possibilities in power transmission. Costs and performances compared

By Dr. Richard Apt
Director V. L. G. Cable Company, Berlin

That aviation will necessitate some change in American high-tension transmission practice is the opinion of Dr. Richard Apt, director of the V. L. G. Cable Company of Berlin, who is at present visiting this country, to study our cable system.

When asked by the Electrical World *to comment on the outlook for high-tension cables suitable for American electric light and power conditions Dr. Apt made the following remarks:*

JOINTLY with friends in the German cable industry, Messrs. E. Hartmann, Duisburg; A. Geissler, Mannheim, and R. Halbreiter, Rheydt, I came to America for the purpose of personally familiarizing myself with the status of American cable technology and discussing with American engineers the problems which exist in cable technology and power transmission by cables.

Overhead circuits are exposed to a great extent to the influence of the weather, particularly storms and rain. It is true that it has been possible greatly to increase the mechanical and electrical strength of the insulators; nevertheless, to the open-air circuit there always adheres the disadvantage that it is subject to all influences, even to intentional interference. Industries in which continuous power supply is a prerequisite may therefore hesitate to permit their plants to be fed by an overhead feeder. To this must be added that it is practically impossible to run overhead circuits of high voltage in cities.

For exactly the same reason that satisfactory telephone communication only became possible when the telephone wires were in cables, development of high-voltage power transmission will also aim at underground distribution. An important factor leading to such a decision is the development of aviation. There can be no doubt that aviation will in a few years increase many times beyond its present status and that regular air lines, similar to our present railways, will run through the country. In Germany regular aviation service has already reached noteworthy proportions, and the development in this country, with its disproportionately greater distances, will undoubtedly be similar to that abroad. For aviation, however, high-voltage lines represent a great danger, and there will hardly be any means, for instance in the event of sudden fog, to render the existence of overhead lines noticeable to the flier.

The cable industry of the old world and the new has, on the strength of these considerations, most zealously promoted in the last few years investigations in high-voltage cable technology and in the manufacture of the cables themselves. Extremely careful examination and testing of the material, particularly of the paper and the impregnating substances, has led to great improvements and has rendered it possible materially to increase the specific disruptive strength of the insulation. The realization that punctures in cables are as a rule attributable to gas inclusions has led to special precautions in the manufacture of the cable and of the saturating substances in order to prevent the formation of gas bubbles within the active insulating material.

Hand in hand with the perfection of the manufacture went scientific researches. Cable works of even moderate size today possess laboratories equipped with transformers for voltages of from 500,000 to 600,000, so that all problems of high-voltage cable technology can be looked into and investigated.

An important step in advance was the building up of the so-called ionizationless cable by wrapping around the insulation a thin metal band or metalized paper according to Höchstätter. The idea that it is of primary importance to keep the insulating cover impregnated with oil has led to the interesting development of the Pirelli cable, in which a hollow conductor is kept constantly under oil pressure, and the New York Edison Company and the Commonwealth Edison Company of Chicago have installations of such cables rated at 132,000 volts.

In Germany cables for voltages of 100,000 have likewise been installed, and these with those in America leave no doubt, so far as the experts in problems of cable technology are concerned, that it is safe to carry out power transmissions for interconnected systems at 100 kv. with cables, and even an increase in the voltage to 200 kv. will hardly present insurmountable obstacles.

For these high voltages, of course, only single-conductor cables can be considered, even for alternating-current systems. Three-conductor cables would be too heavy. Moreover, the manufacture of the joints presents substantially greater difficulties than do joints for single-conductor cables. Moreover, the losses in the lead jacket of the single-conductor cables is not serious, especially if large quantities of energy are transmitted. The capacity of the cable network may also serve to improve the load factor. When the leading current becomes too great a compensation can be carried out by means of reactors.

Cost No Handicap

Now, as regards the question of cost, undoubtedly a long-distance circuit made of cables will always cost more than an overhead line of the same voltage. It must be considered, however, that cables can be used with much larger cross-section for the single conductor than is possible with overhead lines, so that it will not always be necessary to raise the voltage in cables as high as in overhead circuits. It is evident, however, that the expenditure for the maintenance of the cable network and the supervising service will be much smaller than with an exposed overhead circuit. Likewise, the life of the cables, according to the experiences so far gathered, is much longer than that of overhead lines where it is necessary to replace the insulators after a lapse of years. If, therefore, the annual cost of the overhead line is compared with that of cables for each kilowatt transmitted, figures will be arrived at in many instances which render the use of cables thoroughly economical for large energy transmissions with high voltages.

My conviction, therefore, is that in the technology of the transmission of power the same development will take place as in telephony. It is true great problems have still to be solved, and to that end the experts in cable research in the various countries should co-operate with each other through a joint interchange of experiences and experimental results. Perhaps it would be a worth-while move if within the International Electrotechnical Commission a special committee were formed for studying these questions.

Manufacturers Talk of Price Cutting

A group of selected letters from executives in different fields of electrical manufacture discussing who is to blame for the trouble in this buyer's market and commenting on the possibilities for reform

THE series of articles, editorials and letters from our readers which have been published in these pages since the appearance on Feb. 18 of the article by Earl Whitehorne entitled "Who Pays the Cost of Price Cutting?" have brought forth many letters of comment and opinion. Many manufacturers have related in detail experiences with buyers in which undoubted pressure has been applied to incite the salesmen to a competition in paring profits. They have been depressing both in number and in similarity because they evidence how far has gone this epidemic of profiteering by purchasers, through the gentle art of pitting one salesman against the other, taking advantage of the present mad competitive struggle for volume. Many, however, have testified to the price cowardice of sellers as the chief course of demoralization in the market place.

Also, many constructive ideas have been advanced. Some purchasing agents have stoutly contested the innocence of the buyer. Others have frankly argued for a broader recognition of the economics of purchasing and more ethical practices, as in the case of the article by the president of the National Association of Purchasing Agents printed in the ELECTRICAL WORLD on April 21. The following series of extracts from letters from the executives of manufacturing companies have been selected from the pile to present a cross-section of the sellers' viewpoint, as it has been reflected by readers of these articles:

Destroying Price Levels for Allied Lines

By a Manufacturer of Control Apparatus

The present price-cutting situation in the electrical industry is serious. Unfortunately it appears that a good percentage of the manufacturers in the electrical industry, through necessity for more business, have more or less lost sight of their backbone. The average buyer, not taking into consideration the eventual effect, works on the manufacturer's pliant backbone and molds the same to his own desire. The result is an additional cut in price. In my estimation the manufacturer does not deserve any sympathy, but at the same time the situation is decidedly unfortunate.

A contributing factor to the bad price situation also lies in the lack of loyalty among the allied industries. The control manufacturer at the present time is up against a very serious situation imposed upon him by the motor manufacturer. While the motor manufacturer may maintain price on his motors, because of the longer discount which he is receiving from the control manufacturer, he has quite a bit of leeway in discount to play with, and does not hesitate at all to turn a good portion of this discount over to the buyer. Time and again the customer can buy our control cheaper through a motor manufacturer than he can buy from us direct and, this being the case, it naturally gives the control buyer a considerable leverage with which to lower the control manufacturer's price. We have known of some instances where the motor manufacturer was so hungry for business, or so anxious to do the buyer a favor, that he included the control apparatus in his motor bid at the exact cost of the control equipment to the motor manufacturer. Nor will the motor manufacturer listen to reason when this very bad situation is called to his attention, and it is his argument that since he buys the control apparatus, and pays for it, it is his privilege to do with it whatever he wants to. Technically he is correct, but practically he is making life miserable for the control manufacturer.

One-Price Policy a Cure

By a Bearing Manufacturer

In my opinion the only practical solution is to encourage both purchasing agent and seller to submit closed quotations which shall not be subject to further change. If the manufacturer would stick by his first price the purchasing agent would be unable to gain anything by quasi-crooked purchasing methods. If the purchasing agent would at the outset state that he would not lend himself to such practices and insist upon the best price once and for all, then many of the complaints of which you very properly write would be avoided.

Price Squeezing Impairing Quality

By a High-Tension Equipment Manufacturer

At the present time the situation is very bad from the viewpoint of the manufacturer, due to the fact that it is a buyer's market. The buyer is undoubtedly convinced of this fact and is taking undue advantage of this condition by telling the manufacturer just how much he will pay for the manufacturer's product. This condition is certainly a most unhealthy one because in the end it must result in disaster to the manufacturer who allows the purchaser to name his price for the equipment to be bought.

In consequence of this unfortunate situation manufacturers of all types of equipment of a certainty must be offering material of an inferior quality to that purchased during 1925-26, and in all probability, unless conditions change in 1928, this practice will be continued. In other words, this ceaseless sparring between the purchaser and the manufacturer is doing a lot of harm to both parties and in the end is going to result in more operating troubles, less responsibility on the part of the manufacturer and, what is worse, a decided inclination on the part of the manufacturer to slip out of his responsibilities whenever possible, due to the natural feeling that he was compelled to take the order at an abnormally low figure and he could not, of course, give the same service as would be possible if he secured normal profits.

Temptation to Sell Low to Carry Overhead

By a Pole Manufacturer

There can be no question but what the interests of a buyer and a seller are exactly mutual. So far it has seemed impossible to find this common ground on which to meet. Nearly all buyers will declare themselves favorable to paying a price which includes a fair margin of profit, but their idea of arriving at that price seems to be to take the lowest bid.

We have noticed a decided tendency on the part of a great many purchasing agents to avoid making any investigation of producing, handling and grading methods and suspect very strongly that the reason for this is that they do not want to be forced to recognize that the commodity of one supplier may be superior to that of another for fear that it might handicap them in

trying to hammer the price of the superior article down to the quotation made on the inferior.

The temptation to cut a price is, of course, always present. Volume has such a tremendous control of costs. When volume is slightly below the standard, then any orders secured at a price above primary cost help pay expense. It is very easy for one to argue himself into a position of preferring to have an order which helps pay expense, even though it does not pay its proportionate cost, than to refuse the order and not have that slight assistance toward operating cost and expense.

So far as I can see about the only thing to do is to continue to lay these problems before the buying public, hoping that in time it will have a favorable effect on those who feel that price is the only measure of value.

Price Hammering on Special Jobs

By a Power Equipment Manufacturer

Realizing that it is hopeless to get the regular price after a price has once been cut on standard equipment, our policy is very fixed and definite; that is—maintain standard prices on standard equipment, and most of our responsible competitors do the same. Let me say that our standard prices show a very small margin between cost and selling price. What is recognized as sound business policy might recommend a greater margin, and this would indicate that an error was made in establishing the standard prices.

The jobs involving special equipment are usually large jobs. This prompts the purchaser to call in a number of manufacturers. They do not know what each one is quoting on, which creates an ideal situation for the purchasing agent, and he has not failed to take advantage of it. This hammering down in price has been gradual, but the seller is responsible for carrying it to its present extreme. If every manufacturer would quote prices that include a profit that he knows is necessary for a healthy condition of his business and refuse to take orders that only help to pay the factory overhead expense the business would divide itself among those who contribute most to their particular division of the industry or in proportion to the extent to which they contribute. This, I believe, will be brought about when both buyer and seller understand the present situation and see where it is leading.

Most Purchasing Agents Absolutely Square

By a Lighting Equipment Manufacturer

Our experience has been that not much of the temptation for price cutting is due to any desire of the purchasing agents of large buyers to keep us from a legitimate profit. The purchasing agent is more concerned in a fair price, coupled with quality of goods and prompt deliveries.

We find that the purchasing agents of large buyers are absolutely "square" and willing to see us make a legitimate profit. They study their jobs and know what is a fair price and investigate the ability of their source of supply to serve promptly. There are still a few of the "old school" who feel a day's work well done only when they have lied to a bunch of salesmen, thereby keeping their companies from earning a legitimate profit, but that type is fast dying out or being placed in other positions where they are not so harmful to their employers. In the selling field the word soon gets around of such unethical purchasing agents and many good stories could be told of how they were cured.

Most of the trouble we have with price cutting in our own line is among the manufacturers' and distributors' salesmen. This practice is more and more becoming a thing of the past and will only be cured when all of us finally sell every one of our salesmen and distributors' salesmen on the fallacy of such a thing.

Lump Sum Bid Unethical

By an Instrument Manufacturer

For many years it has been my opinion that one of the greatest impediments to the general building up of the industry has been the policy of the public utilities to resort to the "lump sum bid."

A large part of our sales activity has been directed toward breaking down this unfair method of purchasing, and I am glad to say that we have had considerable success. In my opinion it is a plan that cannot successfully withstand publicity, not only because of the ethics implied but because the policy tends to throttle development by stifling incentive on the part of the so-called independent manufacturers to develop and continually better devices they now manufacture. I think it is demonstrable that most of the development to which I refer has been contributed by aggressive independent manufacturers who are specialists operating under healthy and normal competitive conditions.

Sliding Scale and Reciprocity

By a Controller Manufacturer

We suffer from the evil that you refer to, although perhaps to a lesser degree than the majority of electrical manufacturers, as we sell on a rigid policy of adhering, without deviation, to our established prices.

There are two other phases of merchandising electrical apparatus that have crept in during the last few years that I feel are detrimental to the business. One is the practice of establishing a sliding scale of discounts, a system of giving large purchasers preferential discounts on account of the potential buying power of these big customers, and additional quantity discounts worked out on a sliding scale, paid in the form of rebates at the end of the year. Any manufacturer, of course, expects to make a certain over-all profit on his products, and in order to give big discounts his list prices must be based accordingly. The customer of small purchasing power consequently pays an excessive price for the apparatus that he buys and the additional profit made on these sales helps the large and powerful purchaser to obtain his goods at a discount.

The other condition that we refer to is the use of reciprocity to coerce purchasers to buy electrical equipment. This is a method of commercial warfare against which the small manufacturer has practically no defense, and the ultimate outcome, if the buyers of electrical equipment do not offer strenuous resistance, would be to eliminate the small electrical manufacturer who does not have big tonnages of steel and other commodities to place. The business of this company has suffered to a considerable extent from the reciprocity pressure, as a number of good-sized orders which were about to be placed with us have been diverted to the large manufacturers due to threats on their part to cease buying from the customer unless the orders were placed with them.

Too Much Salesmen's Gossip

By a Pole Line Hardware Manufacturer

Most manufacturers are hard losers and are more or less jealous of their competitors and will take the business at less than their cost merely to keep their competitor from receiving it.

We do not believe that the manufacturers who are selling a competitive line are close enough that they can sit down and talk over their difficulties without the conversation being broadcast.

The manufacturer pays too much attention to salesmen's gossip about his competitor cutting prices, but if the competitive manufacturers were so lined up that they could discuss costs with each other, I believe a lot of the trouble would be eliminated.

Untrained Salesmen a Weakness

By a Manufacturer of Fans and Blowers

The tendency today in our own industry is to have untrained men and place them out in the field. The result is their lack of real engineering ability, their lack of ingenuity in meeting the unusual situation, causing them to waver in their determination to sell at the right price, and consequently they phone the factory for a reduction in price, making their case as strong as possible with the factory that the competitors are cutting prices. Invariably, from investigations which the writer has made, the salesman either deliberately misrepresented conditions or he merely took the word of the buyer.

We feel that not much progress will be made until manufacturers take the pains and effort to train their men thoroughly so that when the buyer reports that the price is high they are in a position to analyze why their price is high and incidentally show the buyer that they should receive more money because they are furnishing more and better goods, or that they be permitted to omit items which will bring their price on the same basis. Until the manufacturers develop that critical attitude of mind in their salesmen very little progress will be made in any field where engineering is as much a part of the sale as the product.

Fair Play Pays the Purchaser

By a Line Equipment Manufacturer

I have learned both directly and indirectly that when the purchasing department plays absolutely square with any manufacturer the buyer's interests, in the end, will be better taken care of than where the purchasing department resorts to the practice of always taking unfair advantage of the seller.

For example, a certain commodity has been sold for several months at a uniform price, but owing to reduction in price of raw material (and after the manufacturers' present stock is exhausted) this commodity will take a lower price. If, in the meantime, the manufacturer is asked for a quotation on this product by the purchasing department for a customer and this customer has always played fair with the manufacturer he will be "tipped off" that it will be policy for him to delay his purchase on account of reduction in price shortly

to take effect. On the other hand, if the purchasing department has used sharp tactics in its buying, to the detriment of the manufacturer, it will be only too glad to "load him up" at the present high figure.

There is no question but that both parties are in a measure to blame, and I have contended all along that it is absolutely wrong for the purchasing department of the buyer to dictate to the manufacturer or seller at what price his goods should be sold. Unfortunately, the manufacturers are handicapped by present laws, while the purchasing agents can have as many conferences and discuss the buying end, with the sole idea of bringing down prices and playing one manufacturer against the other to accomplish this end, but in no way incriminating themselves.

Product Prestige Proof Against Price

By an Insulator Manufacturer

Graybeards do not endeavor to use reason with the boy in love nor with the man at war—both actuated so highly by emotion or desperation—nor is one to be censured, under the modern code, if he burns up the parlor furniture to keep the kids warm if no other fuel is available. Thus, with tonnage (buying) off, say, 20 per cent and the Overhead boys appearing regularly at table for every meal, what have you except cut prices?

Tell me not in idle patter that business is not emotional largely—especially big business—when an Insull, a Morgan, a Mellon, continue domination because "I like the game." Did not Napoleon and does not Mussolini also like the same game?

If this thesis rings reasonably true, business is not different or better; it is simply surrounded with different trappings—check protectors, efficiency experts, units of millions instead of thousands, and, as of yore, the purchasing agent is simply a salesman on the other side of the fence or a salesman a purchasing agent with change of residence and both aping the Dutch and Indians on the Manhattan purchase, where both thought they had, and wondered if they had, put over a good deal.

Remember, the purchasing agent, in a seller's market, doesn't dare ask, "Is this your best price?"—the sales gent insults easily. So, in a buyer's market, the purchasing agent dares and does ask, and by the time this reaches the sales end it is amplified orally into a demand and visually into an ogre across the desk.

Constructively, I will say that I don't blame either side; that the most salutary movement among the large central-station buyers is the selection of engineers of purchase instead of purchasing machines (clerks). To an engineering mind, one need not get blue in the face trying to explain that the reason "Your price is high" on 60,000 bolts (insulators?) is that there are 50 different kinds of steel and methods of making bolts and a nickel steel heat-treated bolt put in bed with an O.H. mal-born bolt is an insult to bolts in general—and even hard on the nuts!

Finally, you may quietly confide to your friends that all this dilemma may be avoided by making and selling a product so blessed good that buying and using it is a pleasure not to be contaminated by "an extra 10 and two 5's."

Maxfield Parrish does it; Franklin Booth does it; Teague does it; Johannsen does it! Tarnation to the school or system that tends to squeeze all the poetry out of business as the present trend and régime does, with big syndicate headquarters on Broadway or LaSalle Street and robots screwing up nuts or turning handles in Texas, Oklahoma and Vermont!

A General Code of Ethics Needed

By a Wire and Cable Manufacturer

What this industry needs is a code of business ethics—a list of rules applying to all branches of the industry in their relation to each other—a code drawn up by representatives of all branches and subscribed to by all of the members of all branches.

Salesmen and purchasing agents should have copies of this code so that when a salesmen calls on a P. A. he can ask and expect to receive from the P. A. treatment exactly in accordance with the rules and regulations of the code. And, conversely, the P. A. can refuse the salesman certain information by mentioning the fact that the giving out of such information would be at variance with the code.

In other words, we would all know how to conduct ourselves without fear of doing what is really right, as we have now.

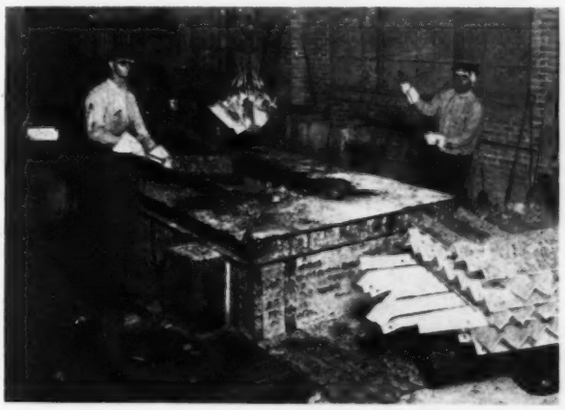
Galvanizing with Electric Heat at Gary

By Eugene A. Longgood
Industrial Power Sales Engineer
Northern Indiana Public Service Company, Hammond, Ind.

WHAT is believed to be the largest electrically heated galvanizing tank in the world is installed in the Gary plant of the Walter Bates Steel Corporation, which fabricates steel for transmission line towers, substation structures, floor gratings and various other purposes. The tank is 30.5 ft. long, 48 in. deep and 22 in. wide and holds approximately 45 tons of spelter. Around it was built a furnace having three 135-kw. heating zones of equal length. Each zone contains three horizontal rows of heating elements, one above the other, on both sides of the kettle. The heating element—a continuous ribbon—is laced over the insulating supports, which form an integral part of the brick lining. Each zone is on one phase of a three-phase transformer bank and is controlled through a high-low switch. The temperature is automatically held at 820 deg. F. by pyrometers. The General Electric Company designed the furnace and furnished the electrical equipment.

The installation has a rated capacity of four tons per hour and a guaranteed consumption of 210 kw.-hr. per hour when galvanizing one ton per hour, 275 kw.-hr. per hour at two tons per hour, 345 kw.-hr. per hour at three tons per hour and 405 kw.-hr. per hour at four tons per hour. The standby losses were guaranteed not to exceed 90 kw.-hr. per hour when the kettle is covered and 140 kw.-hr. per hour when it is uncovered. The performance is about 15 per cent better than guaranteed. The minimum cost for electricity, which was obtained at the maximum production rate, was $1.50 per ton of steel galvanized; the average cost is $2. These figures are inclusive of energy used for maintaining the spelter temperature throughout the 24 hours of the day.

Power is supplied by the Northern Indiana Public Service Company under its demand schedule, with an off-peak clause. As the off-peak clause allows the use of 20 per cent of maximum demand during the peak, the fabricating part of the plant can work its regular hours.



Electrically heated galvanizing kettle in plant of Walter Bates Steel Corporation

Practically the entire output of this plant is galvanized and since this kettle was put in operation on May 10, 1927, production has run as high as 50 tons in twelve hours.

Automatic temperature control assures that the zinc is applied within the ideal heat range, resulting in a uniformity of coat that is highly desirable. This also saves spelter. Longer tank life is obtained because of the

absence of oxidizing flames and due to the fact that the average temperature gradient in the wall of the pot is from 1,100 deg. to 820 deg. with electric heat, whereas it is about 1,600 deg. to 820 deg. with flame heating. The quality of the product and the cost per ton have been so satisfactory that this company has planned a second kettle, of double the width and longer, to take care of the increased tonnage requirements of its fabricated tower and pole business.

Extending Investment List Strengthens the Markets

Effect of recent New York legislation already evident in behavior of power and light securities

THAT recent legislation in New York State which widens the market for public utility securities has been effective and is likely to be still more so is indicated by the behavior of the security markets for these issues subsequent to the passing of the new legislation. Although not specifically designated, an examination of the securities coming within the provisions of the act indicates that a number of preferred issues and debentures of electric power and light companies, both operating and holding companies, have been legalized. Naturally this will influence the yield rate at which securities coming under the new legislation will be issued.

Much has been said of the rapid expansion in available investment funds of financial institutions. The number of individual trusts also has grown rapidly, and the funds available for investment in the assets of insurance companies have grown by leaps and bounds. As a consequence, there has been no little agitation for a widening of the legal investment lists of these institutions. Among the laws recently enacted relating to investments in New York savings banks one act makes provision that a savings bank under certain stipulated conditions may invest its assets in first or refunding mortgage bonds of designated electric, gas and telephone companies within the United States. It is added that a savings bank may not invest more than 10 per cent of its assets in electric or gas company bonds, or more than 10 per cent in telephone bonds.

Definite Requirements Laid Down

While the new legislation does not make any blanket provision for investing in the securities of all power and light companies, it lays down definite stipulations with regard thereto. The corporation, for example, must have been in existence, as a rule, without default for eight years immediately preceding the investment; it must have outstanding stock equal to at least two-thirds of the bonded debt; it must have average yearly earnings for the preceding five years of at least twice average annual interest charges on its bonded debt during the period; it must have had net earnings of at least twice interest charges for one full year preceding the investment. The average gross operating revenue, moreover, must have been at least $1,000,000 a year for the five years preceding investment in the case of electric power and light companies. During each of these five years dividends of 4 per cent upon the minimum capital stock must have been earned or paid. With regard to the bonds themselves in the case of power and light companies, they must be part of an issue of at least $1,000,000 and the aggregate amount of bonds issued should not exceed 60 per cent of the physical value of the property.

New legislation relating to the investment of life insurance companies makes provision that domestic life companies may invest in the bonds, notes, debentures and preferred or guaranteed stock of any domestic corporation which has earned at least 4 per cent dividend on its capital stock during each of five years preceding. No insurance company, however, may invest more than 2 per cent of its assets in such securities or purchase more than 10 per cent of preferred stock of any one company.

The list of power and light company bonds coming under this new legislation relating to savings bank and trust investment has already been published in the Electrical World, issue of April 21, page 838. While the new legislation deals with only one state, it involves a huge amount of investment funds, and it may be assumed that the step taken is just one step in the direction indicated.

Selling Organization and Procedure at Topeka, Kan.

By W. A. Gregory
Commercial Manager Kansas Power & Light Company, Topeka, Kan.

TO INCREASE energy consumption by merchandising revenue-producing appliances in the most effective and economical manner the sales department of the Kansas Power & Light Company has divided the city of Topeka, with a population of about 56,000, into eight districts and assigned a salesman to each. Each salesman receives credit for all sales in his territory, whether they are made by himself or not. Compensation is at the rate of $75 per month plus 8 per cent on all regular sales. In "employee sales" campaigns the commission may be more or less than 8 per cent. Salesmen furnish and operate their own cars.

CREDIT POINTS DETERMINE MONTHLY AWARDS TO APPLIANCE SALESMEN

	Points
Sales	
Credits—Cash sales (per $100)	10
Short-term contract (each month off maximum terms)	1
Down payment (each 50 per cent increase of minimum down payment)	1
Largest gross sales	10
Quota attained	5
Debits—Reverts (each $10)	1
Conduct	
Credits—Best general conduct for month (this to be judged by district manager and commercial manager and based on all activities of salesmen)	6
Debits—Absence from sales meetings (no excuses accepted)	2
Tardy to sales meetings (no excuses accepted)	1
Smoking in salesroom (during business hours)	1
Personal appearance (if it becomes necessary to mention same)	1

Short meetings, which all salesmen, floor clerks and supervisors are required to attend, are held each morning at 8 o'clock for the purpose of imparting information, checking sales reports and giving special instructions. On Monday evening of each week there is a meeting attended by the utility service men and sales force to enable manufacturers' representatives to give them instructions and tips on their particular products. To every fourth one of these meetings the wives of the employees are invited and the affair becomes a sort of family party, with refreshments and some entertainment feature. Each

month the commercial manager writes personal letters to the wives of the salesmen, telling them what appliances are being pushed, the records their husbands are making and explaining their work. These letters have been welcomed by the salesmen because they simplify the problem of fitting evening calls into their domestic relations. It has also been demonstrated that a wife's acquaintance with her husband's work is beneficial to all concerned.

Except for large appliances, salesmen make deliveries. Demonstrations of devices are made by the salesmen on their personal responsibility, the appliances being charged to them during the period of the demonstration. It is also the duty of the salesmen to see that devices returned from demonstration are put into clean and salable condition. List prices are maintained. Terms of payment vary with different types of merchandise, but the carrying charge is fixed at 6 per cent. All credit arrangements made by salesmen are subject to approval by the credit manager. Salesmen are empowered to make trade-in allowances on their own responsibility. Trade-ins are charged to a salesman's account at the price he allowed plus any service charges to put the merchandise in salable condition. Trade-ins are held in company stock and exposed for sale for 60 days. At the end of this period a trade-in is billed to the responsible salesman and he must remove it from stock within fifteen days. Commissions are not allowed on resale of trade-ins, but the difference between the resale price and the trade-in allowance, plus service charges, is paid.

To add incentive to the selling job a contest is conducted in which prizes of $25, $15 and $10 are awarded each month to the highest rating salesmen. Points are credited according to the accompanying schedule.

Tungsten Lamps in Therapy

By M. Luckiesh
Director Lighting Research Laboratory, National Lamp Works, Nela Park, Cleveland, Ohio

ALTHOUGH radiant energy of various kinds is already serving well in the prevention and cure of diseases, many phases of radiation-therapy have not emerged from the twilight zone of knowledge.

We do know that much of the energy emitted by tungsten-filament lamps will penetrate to a considerable depth into the human body. On being absorbed most of this energy is converted into heat. This localized heating is achieved with less discomfort and often with greater safety and convenience with tungsten lamps than with hot towels or heating pads. Therefore, there are many legitimate uses for large tungsten lamps where such heating is desired. Perhaps medical research will establish many other uses of these lamps in the preservation of life and health.

PERCENTAGES OF TOTAL ENERGY EMITTED BY THE FILAMENT OF A 500-WATT MAZDA LAMP IN VARIOUS SPECTRAL REGIONS

Special Region	Wave Lengths	Per Cent of Total Radiation
*Far and middle ultra-violet ..	(λ2,000 to λ 3,200)	0.02
Near ultra-violet	(λ3,200 to λ 4,000)	0.2
Visible	(λ4,000 to λ 7,600)	12.4
†Near infra-red	(λ7,600 to λ14,000)	35.4
Far infra-red	(beyond λ14,000)	52.0
Total	(λ2,000 to limit)	100.0

*Effective in rickets, etc.; not transmitted by ordinary glass.
†Transmitted by water (of which flesh is largely composed).

Progress in ultra-violet-therapy has been going on for years, but only recently has the public become interested. Much value of sunlight arises from the ultra-violet rays, particularly those which are not transmitted by ordinary glass (wave lengths shorter than λ3,200). Naturally this has led to a flood of inquiries regarding ultra-violet radiation emitted by tungsten filaments. Only 0.02 per cent of the total energy emitted by the filament of a 500-watt tungsten lamp is of wave lengths (shorter than λ3,200) which produce effects similar to those of one of the vitamines—preventing and curing rickets, for example.

The very small amount of this ultra-violet radiation that is emitted makes the tungsten lamps appear unpromising in this field of therapy at present. Obviously no special bulbs can increase the ultra-violet emissivity of the filament.

Utah Sells 1,841 Washers in One Month

WHEN the Utah Power & Light Company sold 1,841 washing machines during its eighth annual March washer campaign it broke not only all of its own previous records but established what is believed to be a record sale for the entire country. The slogan "A Copper Washer for a Silver Dollar," as in past years, played an important part in the campaign. Terms were $1 down and $5 per month. A quota of 1,000 machines

One of many store displays which aided in sale of 1,841 washers during month campaign

was apportioned among the company's divisions, according to the number of customers in each. Employees other than the regular sales force were permitted to participate in the benefits of the campaign by the payment of $2 in cash for every prospect turned in which resulted in a sale.

Newspaper space was liberally used and special attention was given to store and window displays. The accompanying illustration shows rather an unusual store display which created interest. Sales during the March washer campaign of previous years were as follows: 1920, 1,711; 1921, 1,168; 1922, 1,191; 1923, 1,118; 1924, 1,148; 1925, 1,264; 1926, 1,012; 1927, 1,367. The total number of machines sold during these annual campaigns, including the 1,841 recently sold in March, 1928, now amounts to 11,820.

High Voltage from Clouds

Preliminary results from German endeavor to secure atomic breakdown from atmospheric electricity. Work to be continued

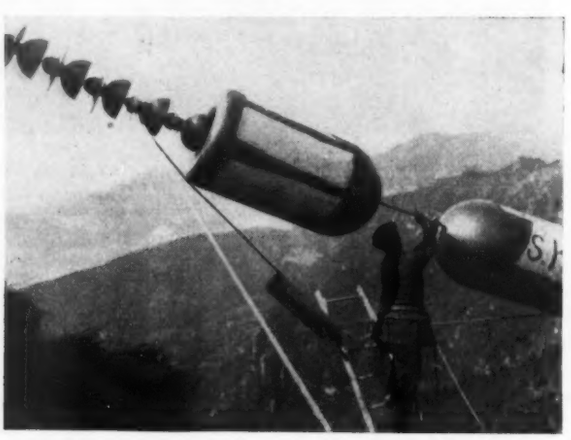
By Dr. Alfred Gradenwitz
Berlin, Germany

ACCORDING to an account of preliminary tests given by Dr. Lange, assistant at the Physical Institute of the University of Berlin, at a recent meeting of the German Physical Society, he and his fellow workers A. Brasch and C. Urban expect by means of atmospheric electricity during thunderstorms to break up atoms during the coming summer.

Accurate measurements of thunderstorm fields have shown the existence of field intensities up to a few hundred thousand volts per meter, so that a potential of, say, 5,000,000 to 30,000,000 volts is found to exist at a height of 100 m. If these potentials could be brought under control they would afford a means of producing extremely rapid corpuscular rays, of the same kind as those so far yielded by radium, though in much greater abundance.

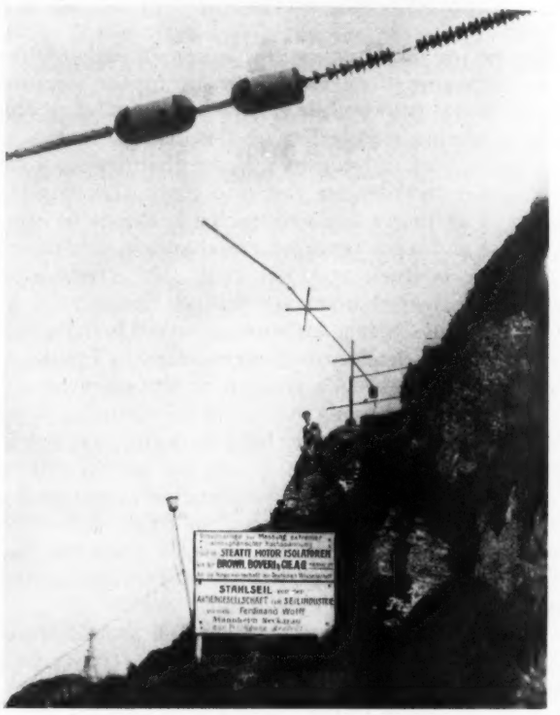
The three experimenters found the most suitable place for installing their apparatus to be on the summit of Monte Generoso, a beautiful peak towering to a height of about 6,000 ft. near Lugano, which is noted for the frequency and violence of its thunderstorms. Also a mountain railway leading to the summit made this site an especially desirable location. The use of kites or balloons for collecting the electric charges was, of course, out of the question, such unstable systems constituting a serious danger to the experimenters. Only a stationary installation could be used and the three physicists chose a suspended network held by a messenger cable stretched out in a free span, antenna fashion, between two mountain tops.

Two experimental outfits were installed in succession, a smaller one for preparatory tests and a larger plant for what was intended for a definite test. The atmospheric



Corona cylinders on antenna at Mount Generoso

electricity was collected by means of a network of wire comprising a multitude of small points, losses in leading in the collected charge being reduced to a minimum. Adequate insulation was provided at both ends of the messenger cable, which was given a radius of curvature as large as possible. The span adopted in connection with preparatory tests was 270 m. long, the network being situated at a height of 40 m. above the ground and insulated with 25 insulators. The lower part of the messenger cable, which served to lead the collected charges to the measuring instruments, was protected against corona losses by threading over it a series of hollow cylinders of very light material (thin galvanized-iron sheet) with



Antenna installation on Mount Generoso

a progressively growing diameter toward the ground. A potential of 3,000 to 5,000 volts was noted in normal cloudless weather, which, however, would grow to 70,000 volts (with several million amperes) whenever there was a thunderstorm passing over the plant. Two kinds of discharge were noted: First, those attending the passage of a lightning flash in the neighborhood; second, those characterized by a uniformly high potential and a uniform sequence of sparks not passing across the insulators.

After conducting a set of preparatory tests with this small plant, a larger plant, with a span 760 m. long and a network stretched out at a height of about 80 m. above the ground, was installed. Voltage and other readings were taken from a small lightning-proof metal cabin, in which the spark gap installed below the corona guards could be controlled. The actual field intensity between the end of the antenna and the ground could not be ascertained, the clouds of ions produced by corona interfering with the normal distribution of field intensities at the very high potentials.

The installation of the larger plant was commenced in July, 1927, and, on account of local difficulties, could not be completed before the end of August. The main thunderstorm season was over, therefore, there being only one thunderstorm actually passing over the completed plant. This storm, however, unmistakably showed that very high potentials could be attained by the experimenter. The maximum sparking distance of the spark gap, which was 4.5 m., was readily bridged, the sequence of sparks during the period of maximum strength being about one per second. These discharges continued dur-

ing 30 minutes and were remarkably constant. Actual experience with an auxiliary antenna and with remote thunderstorms showed that with such a dense sequence of sparks it was always possible to extend the spark gap to about twice its initial sparking distance before the limit of sparking was reached. Inasmuch, however, as such an increase in sparking distance was not feasible during thunderstorms a potential of only 2.3 million volts can be stated to have been measured, which corresponds to a sparking distance of 4.5 m.

The plant was left in position during the winter and is now to be extended so as to lend itself to measuring voltages several times as high. The potentials are so high, in fact, as to warrant the prediction that a definite success will be recorded in the endeavor to secure a breaking up of atoms.

Letters from Our Readers

Suggests Salesman's Approach to Executives

To the Editor of the ELECTRICAL WORLD:

I have read with a great deal of interest your editorial in the ELECTRICAL WORLD, issue of April 21, "The Salesman's Approach to the Executive." It occurs to me that the matter which you discuss has been improperly handled in the past due to the precise reasons as set forth. In my opinion more could be said as to the salesman's approach and I would suggest your consideration of the following facts for a further discussion of this subject through your columns.

In addition to submitting a business proposition, the salesman should bear in mind the fact that the executive does not think in terms of merchandising. He is interested only in technical matters pertaining to the operation of his property in order that his earnings may be adequate. When he is presented with a proposition which deals with earnings he at once becomes interested, and this interest can only be held through continuity of the same practice; that is, discussing earnings. Perhaps I can make myself better understood by assuming a salesman who is interested in selling 50,000 50-watt "Mazda" lamps to customers having an aggregate of 50,000 empty sockets. In order to secure the approval of this plan the salesman should point out to his executive that he is not particularly interested in the merchandising phase of the transaction, but is primarily interested in adding to the company's income, the potential income to be derived from this sale of 50,000 lamps. To set up his exhibit properly the salesman will point out to the executive that 50,000 50-watt lamps burning a lamp life average of 1,000 hours at 10 cents per kilowatt-hour will return $250,000, without adding one cent to capital investment account.

Likewise, a salesman contemplating a flatiron campaign should set up the same type of exhibit. He should, first of all, point out the potential revenue to be derived as a result of a certain number of irons sold. He probably is setting up a quota, in which case the quota figures should be used, the revenue to be derived based on the figures of the N.E.L.A., which would be considered authoritative. I am quite sure you see the point which I am making and which I should like to emphasize further with some personal experience.

A number of years ago, when I was connected with some of our operating companies, we were making figures on power requirements for certain coal mining operations which were at that time using their own power. We found it to be necessary in those pioneering days to present our proposition in a manner which would be understood by the coal operator. In other words, we had to reduce our sales to cost per ton of coal mined rather than cost per kilowatt-hour for electrical energy. This resulted in building up a very large volume of business. It was found at that time that other electric light and power companies were attempting to secure the same class of business on the basis of cost per kilowatt-hour. The result was that little headway was being made because the operator was not informed on such technical matters and, in fact, was not interested in the cost per kilowatt-hour. He only knew the cost per ton of coal mined.

We have the same picture in discussing a power proposition with a flour mill operator. It is absolutely impossible to make marked headway in this case if the cost per kilowatt-hour is discussed. The flour mill operator understands only the cost per barrel of output.

In conclusion, our executives, or our operators as you may choose to call them, are in about the same position so far as merchandising terms are concerned. It is difficult to secure their wholehearted and enthusiastic backing unless you can point out profits, and the profits which they are particularly interested in are those which reflect in the net earnings from operation. Merchandising profits are secondary.

C. J. EATON,
Vice-President in Charge of Merchandise Sales.
Middle West Utilities Company,
Chicago.

Conductor Movements Influence Line Design

To the Editor of the ELECTRICAL WORLD:

We have noted with interest the editorial entitled "Conductor Movements Influence Line Design," which appeared on page 695 of the April 7 issue of the ELECTRICAL WORLD. Some of the values given seem to be in error, however, as we note there is a tension of 10,400 lb. on a No. 4/0 conductor. The minimum breaking strength of a No. 4/0 copper conductor, according to A.S.T.M. specifications, is in the neighborhood of 9,200 lb., while the minimum breaking strength of a No. 4/0 A.C.S.R. conductor is about 8,500 lb. We, therefore, question the tension of 10,400 lb. mentioned in the editorial.

Another point which occurred to us was the fact that there was a maximum throw of conductors of 4.07 ft. when used on a 150-ft. span. We are wondering whether this amount of throw was permitted by the sag in the conductor or whether an elongation in the conductor took place due to the high current suddenly thrown into the line which would be accompanied by a temperature rise.

DAVID T. WERNER.
New York, N. Y.

[The tension of 10,400 lb. mentioned in the editorial referred to represents the pounds per square inch allowed in the conductors and not to actual stringing tension of the conductor. However, there was one error in the figures given. It was stated that the conductor spacing was 4 ft. Although a number of tests were made at this spacing, the spacing was 18 in. in the particular case mentioned.

The sag of the conductor was approximately 1 ft. and the throw of 4.07 ft. was permitted partly by temperature rise due to the high current and partly by elongation of the conductor due to the very high stress set up by the violent repulsion of the conductors. Of these factors the latter was by far the most important.—EDITOR.]

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Direct-Fired Powdered Fuel Boilers with Well-Type Furnaces. — H. M. CUSHING and R. P. MOORE.—The 1926 extension to the Charles R. Huntley station of the Buffalo General Electric Company includes the addition of four 1,250-hp. boilers each with water-cooled furnace walls and 76 per cent economizer surface. The article describes the evolution of the furnace design, gives reasons for the selection of pulverized coal and the adoption of the direct-fired system and presents the operating results. Tests indicate unit efficiencies in excess of 85 per cent within the operating range of the equipment, which is from 125 per cent to 550 per cent of the rating of boiler and walls. The adoption of well-type furnaces for this station has enabled the utility to utilize coal with a low fusion temperature of the ash and no efforts are made to cool the ash which collects on the inner surfaces and gravitates in a liquid state to the well. The ash remains in a molten state until removed at desired intervals. This practice permits the use of the less expensive fuels and is said to represent an improvement in ash handling in pulverized fuel plants.—*Transactions of the American Society of Mechanical Engineers*, January-April, 1928.

Some Economic Factors in Power Station Design.—H. BOYD BRYDEN.—As a result of an analysis of design factors in connection with several generating stations, the author has concluded that the adoption of a 400-lb. operating pressure is desirable because of simplicity, ease of operation and cost of equipment. Conditions under which 1,200 or 1,500-lb. steam pressures may be attractive are anticipated and foreseen as desirably applicable to generating station work. On the contrary, 600-lb. pressures are discerned as offering few advantages. The author has reached this conclusion as the result of an examination of fixed charges, capacity and operated-hours factors. — *Mechanical Engineering*, May, 1928.

Transmission, Substations and Distribution

Some Experimental Results for Lightning Arresters.—H. ROKKAKU.—A comparative study of the various types of lightning arresters utilized in connection with high-voltage transmission circuits has been undertaken by the author. Observations secured through the use of the Braun tube are considered to offer the most informative data regarding the various styles. Arresters of the oxide film, air film, glass bead, carborundum and autovalve type were tested under similar conditions. It is concluded that the oxide film arrester has an ample discharge capacity, but there seems to be some uncertainty of action due to the change of material and displacement within the arrester cell. This type failed to indicate in these tests an operating reliability commensurate with that of the glass pellet and air film arresters. It is stated that any one of the arresters is subject to uncertainty of action due to the change of the materials with time, and that tests made with the Dufour oscillograph indicate behavior under single impulses which give satisfactory results.—*Journal of the Institute of Electrical Engineers of Japan*, March, 1928.

Time-Limit Fuses. — G. W. STUBBINGS. — It is the contention of the author that an exponential expression for the time-current characteristics of a fuse is based on an erroneous assumption and that it is hardly possible to secure more than an approximate value for the limiting current of a fuse by calculations based upon experimental values of the current for moderate time lags. A simple algebraic expression has been developed as a substitute for the more complicated exponential one and the curves have been derived to illustrate the simplified method used by the author for obtaining approximate time current accuracy. — *Electrical Review* (*England*), April 27, 1928.

Motors and Control

A New Starting Pulley. — H. H. SCHULMANN.—A new starting pulley designed to permit the application of squirrel-cage motors where the use of such equipment has been restricted due to the heavy surges involved in starting, and more especially when starting against a full load torque, has been devised. It is stated that the use of this pulley makes the starting conditions of ordinary squirrel-cage motors and of double squirrel-cage motors quite as favorable as those of the slip-ring motor. It is also said that the simpler construction and the minimized attention requirements, better efficiency and power factor of the squirrel-cage motor may now be utilized without difficulty. The mechanism consists essentially of a centrifugal device, forming the necessary connections between the driver or driven parts. An important feature of this device is that the centrifugal weights which bring about the power transmission are not rigidly connected to the driving or driven parts. Cone-shaped disks move in an axial direction and are fitted on their outer surfaces with brake pieces of a material with a high coefficient of friction and good wearing properties. The inclosed form of this device permits its utilization under extreme dust conditions.—*A.E.G. Progress* (*Germany*), March, 1928.

Units, Measurements and Instruments

Design and Behavior of Magnetic Potentiometers. — J. ERNEST SHAW. — The possibilities in the use of the magnetic potentiometer for general electric measurements have led the author to discuss its application with particular reference to alternating current in networks that could not otherwise be easily measured, circulating current in various parts of machinery, reluctance of magnetic joints, ampere-turns on any assigned part of a magnetic circuit, exploration of leakage fields and similar applications. The theory and application have both been considered and direct-current and alternating-current measurements have been given special consideration. The design and the calibration of the potentiometer has also been considered and it is stated that it is always advisable to calibrate the potentiometer before making any measurements with the particular instrument with which it is to be used as considerable errors occur in calculating factors for a given circuit, the cross-sectional area and currents per centimeter are not uniform. The applicability of this device to the measurement of high-frequency current is pointed out. — *Electrical Review* (*England*), April 20, 1928.

A Water-Level Gage of the Long-Distance Recording Type. — E. B. STROWGER.—The practical use of a water-level gage for hydraulic developments, utilizing the selsyn motor principle, is described by the author. The gage consists, essentially, of two selsyn motors. The position of the rotor of the transmitting device is controlled by a float or some similar means. The receiving motor operates a pen carriage which records, on a paper with suitable scaled divisions, the movements of the transmitting equipment. The motors are essentially induction motors with wound rotors excited from an alternating-current source. Conditions in the plant under discussion required close supervision of the headwater level because of the comparatively shallow intake existing at this development. — *Mechanical Engineering*, May, 1928.

Heat Applications and Material Handling

The Behavior of Metals and Alloys During Hot-Forging.—W. L. KENT.—The research described in this article was initiated in order to investigate the forging properties of metals and alloys with a view to the application of a forging test as a measurement of their malleability at high temperatures. Many investigations have previously been made to determine this property by

means of ordinary mechanical tests, but results given have not been entirely satisfactory. It is stated by the author that no mechanical test made may be considered satisfactory for this purpose, and that the only way in which malleability of a material may be determined is by actually rolling, drawing or otherwise working it under industrial conditions. It is, however, indicated in the present discussion that under certain circumstances useful information may be obtained regarding the variation in the working properties of a material with rise in temperature by combining the results of a special test herein described with that of a standard procedure. — *Engineering (England)*, March 16, 1928.

The Autogenous Welding of Stainless Steels.—The desirability, wherever possible, of subsequently heat-treating all stainless steel articles after the completion of the welding process is pointed out by the author. It is shown that all commercial welding involves heating the parts to be welded to a high temperature, usually approaching the melting point of the metal. This induces the formation of a coarse crystalline structure in the material in the region of the weld. In the case of the air-hardening stainless steel increased hardness is produced as a result of cooling in air from a high temperature. These two factors cause the resultant welded material to lack toughness. A comparison between various types of stainless steel and the difficulties encountered in the welding process have been covered in this discussion. Temperatures, electrodes material compositions, process requirements and general welding procedures, suggested in handling this material, have been covered by the author both for electric arc welding and for gas welding. —*Engineering (England)*, April 20, 1928.

Electrophysics, Electrochemistry and Batteries

Electrolytic Gas Generation Under Pressure.—J. E. NOEGGERATH. — The electrochemical production of hydrogen and oxygen on a commercial basis furnishes gases of a remarkably high purity, but the installation of motor-driven compressors, by which the generated gases are forced into the customary steel cylinders, decreases the over-all efficiency of such a plant and makes close attendance a necessity. If the water dissociating cell is completely sealed the generated gas will, without additional effort, gradually reach any desired amount of pressure, and may thus be carried directly into its commercial containers. Certain difficulties have been experienced with the insulation between electrodes and ground to withstand such high pressure. Another problem was to find a safe and fully dependable means of keeping the oxygen and hydrogen separated. The paper describes construction of such equipment, generating gases at a pressure of 2,800 lb. per square inch, which gave excellent service. At this high pressure 3.25 kw.-hr. will produce 35 cu.ft. of gas of over 99 per cent purity. One of the greatest advantages is the exceedingly small floor space required, particularly when compared with gas generators operating at atmospheric pressure. — *Zeitschrift des Vereines Deutscher Ingenieure*, March 17, 1928.

Some Comments on Dry Cell Service and Tests.—C. A. GILLINGHAM.—In a dry cell chemical depolarization takes place only while the cell is under load. Physical depolarization, such as the gradual rise of hydrogen bubbles, takes place both while the cell is under load and after load is discontinued. There are also shelf reactions, such as the slow dissolution of the zinc metal. The cell performs most efficiently, according to the author, when the severity of service is just light enough to allow perfect depolarization without passing beyond this point. The author recommends specific tests for each of the many types of dry cells, emphasizing the desirability of having the individual test conform as closely as possible to the actual service to which the respective type of cell is to be put.—*Report American Electrochemical Society*, April, 1928.

Telegraphy, Telephony, Radio and Signals

Quartz Radio Resonators.—G. W. N. COBBOLD and A. E. UNDERDOWN.—Practical applications of the piezo-electric behavior of crystals and their use for frequency stabilization are reported by the authors. Shapes and dimensions, modes of vibration, other frequency standards and a number of practical applications with particular reference to methods of frequency measurements are included. It is stated that in comparison with forks of special steel, quartz resonators possess the advantage that their natural frequencies are well within the limits of the frequencies used in wireless so that, in comparison with standard electrical circuits consisting of inductance associated with capacity, they are more compact and constant and of lower temperature coefficient. The method of mounting the crystals is indicated as being of considerable importance, as the dependence of the frequency upon the dimensions of the air gap and upon the presence of moisture has been clearly demonstrated. It seems probable according to this determination that the crystal should be mounted in a vacuum and that either blocks of fused quartz should be used as distance pieces between the electrodes, or else the air gap should be dispensed with altogether by pressing one of the electrodes on to the crystal by means of a light spring.—*Electrical Review (England)*, April 27, 1928.

Tuned Radio-Frequency Amplifiers.—R. S. GLASGOW.—A simplified method of calculating the performance of a tuned amplifier circuit is given by the author and the effect of the various circuit constants on the characteristics is indicated. The predicted results are found to check quite closely with experimental observation. Curves showing the performance obtained with various types of tubes are also presented and the factors affecting the stability are pointed out and typical methods for suppressing undesired oscillations are given. The principles involved have been developed as a fundamental consideration applicable to such work.—*Journal of the American Institute of Electrical Engineers*, May, 1928.

Traction

Southern Railway Electrification.—E. C. Cox.—The operating advantages and economies realized in the electrification of the Southern Railway (England) have been outlined by the author. Comparative cost data for railway operations are offered for several divisions of this road and for several other companies. — *Electrical Review (England)*, April 20, 1928.

Miscellaneous

The Strength of Flat Plates.—TANDY A. BRYSON, THOMAS CHEEGER and HARVARD H. GORRIE.—The results of three investigations upon the strength and properties of square flat steel plates subjected to uniformly distributed pressure are offered by the authors. It is stated that the experimental conditions were such that the edges of the plates may be considered substantially as fixed edges. An equation to facilitate the design work in connection with flat plates was developed as a result of work by two investigators, working separately. Experiments to determine the strain actually produced in a flat plate under a uniformly distributed load, followed by an analysis of the stresses developed, is considered in the third paper. Among the conclusions derived are the following: The greatest stress does not occur in the center of the plate, as might ordinarily be expected, and ideal clamping conditions are necessary in order to check by practical investigation the theoretical conditions suggested by the equation.—*Rensselaer Polytechnic Institute*, April, 1928.

A Thermodynamic Study of Fundamental Corrosion Reactions. — W. J. SWEENEY.—The fundamental corrosion reactions of iron in the absence of oxygen and the iron-ferrous ion-hydrogen equilibrium are discussed from an electromotive and free energy standpoint. From a critical survey of the literature on the solubility of iron and of ferrous hydroxide, a solubility product and a provisional value for the free energy of formation from the elements of ferrous hydroxide are obtained. With this value at hand the conclusion is drawn that there is a small free energy decrease for the attack of iron by water to form ferrous hydroxide and hydrogen even in the absence of oxygen. The interdependence of the iron, ferrous ion, hydrogen ion, hydrogen equilibrium and the ferrous hydroxide equilibrium is also pointed out.—*Report American Electrochemical Society*, April, 1928.

Book Reviews

Transmission Line Engineering

By W. W. Lewis. New York: McGraw-Hill Book Company. 360 pages, illustrated. Price, $4.

This is not a stereotyped book on electric power transmission. It is written by an experienced transmission engineer of a large manufacturing company and presents his solutions to the engineering problems most frequently encountered in practice.

The book will enable the student or engineer to calculate all the necessary constants of a line, to determine the performance of a line and to fix stability and power limits on a line. Other topics are the calculation of short-circuit currents, the control of triple harmonics, proper use of auto-transformers, control and calculation of line disturbances, calculation of line losses, telephone interference and line regulation.

College teachers will find this book splendid for use in their classes because of its thoroughness and scope. It is up to date and deals with problems of current importance. These problems should be presented to students, for they require fundamental electrical knowledge for their solution. Mr. Lewis restricts his treatment to electrical problems and rightly eliminates mechanical design features. His book is a welcome contribution to transmission literature.

Emile Berliner, Maker of the Microphone

By F. W. Wile. Indianapolis: Bobbs-Merrill Company. 354 pages, illustrated. Price, $4.

A young man from Hanover started his American career as a clerk in a store and ended it as an outstanding contributor to the development of the telephone and talking machine. Inventive faculties of unusual order are found in Emile Berliner, and in the face of serious difficulties he brought his inventions to fruition and gained international recognition.

In this book the career of Mr. Berliner is outlined in a sympathetic and enthusiastic vein. In addition to an account of the personality and history of the inventor, it provides a résumé of the business and patent aspects of developments in the microphone, gramophone and radio. The early days of these arts called forth strenuous rivalries for success and an enormous amount of patent litigation. The original conception of Bell required a great amount of practical improvement to produce the telephone of later days, and Mr. Berliner did a great deal to develop the variable-contact transmitter, which forms an essential part of the modern telephone instrument. In those days technical knowledge was meager and yet practical, and empirical researches brought forth marvels in the electrical art. Bell, Edison, Berliner and Tesla are typical of noted inventors whose work became extremely valuable because they had the imagination to conceive inventions and in addition the untiring industry necessary to invention based on cut-and-try methods. Mr. Berliner has an enduring place as an inventor of the telephone transmitter, the lateral-disk gramophone record and the microphone. His life as outlined in this book should afford a stimulus to the youth of today.

Induction Motor Practice

By A. M. Dudley. New York: McGraw-Hill Book Company. 236 pages, illustrated. Price, $2.50.

This book is a practical treatment of modern induction motors. It is well illustrated with halftones of machines and line drawings which show motor characteristics, winding schemes, control circuits and design details. Topics covered in chapters are: Fundamental considerations, rotating magnetic fields, mechanical parts and their assembly, windings, types of motors, electrical and operating characteristics, speed-torque curves, control, mechanical considerations and the circle diagram.

In the last part of the book a large number of practical questions about induction motors are asked and answered and a very good chapter is given on the circle diagram and its use.

The book does not develop a rigid mathematical and analytical treatment of the induction motor. It deals with results and applications, but should appeal to a large group of students, electricians and those using induction motors in industry.

American Universities and Colleges

By David Allan Robertson. (The American Council on Education). New York and London: Charles Scribner's Sons. Cloth, 6 x 9 in., 884 pages. Price, $2.50.

The character, scope and organization of higher education in the United States is reviewed in Part I of this volume. Part II presents condensed information regarding each of the universities and colleges on the accredited list of the American Council of Education. Supplementary information regarding thirteen classes of professional and fifteen classes of graduate schools is given in Part I. For some unexplained reason, engineering schools have far less space in proportion to their number than the other schools. Thus 130 engineering schools are given less than three pages, while 25 schools of economics are given eleven pages.

It is a great pity that after bringing together so many figures on a variety of subjects as this volume contains, practically no summaries are included. Another sad lack of the volume is an introduction in the nature of a general summary. Valuable as the book is as a compilation, it is chiefly that and nothing more. Certainly a book sponsored by educators should supply digests of the data it contains instead of compelling thousands of users to make the digests separately or do without.

Book Note

NATIONAL ELECTRICAL SAFETY CODE, fourth edition. By Department of Commerce. Washington, D. C.: U. S. Government Printing Office. 525 pages, illustrated. Price, $1.

The entire code, as revised, has been approved by the American Engineering Standards Committee as an American standard.

This edition represents only minor changes in the general substance of the rules. The regulations dealing with line construction probably incorporate more important changes than any of the other parts, since it is this field of construction regarding which the views of operating engineers represent the greatest diversity of opinion. The rules of this part and also of Part IV have been entirely rearranged, with the hope of facilitating reference and clarifying requirements. Part V, dealing with radio installations, is entirely new in substance and has been prepared to guide the installations of both antennas and interior equipment.

The code rules specifically provide for variation from requirements when circumstances warrant different practice. The rules have been made to recognize conditions as to climate and density of population where these involve a difference in the hazard or the number of persons exposed to the hazard.

THE BLUE BOOK (Electrical Trades Directory and Handbook), 1928. By Electrician. London: Ernest Benn, Ltd. 1,430 pages, illustrated. Price, 25 shillings net.

The book has been extensively revised. The greater part of the Legal Digest has been omitted and is replaced by a new and important feature, the Geographical Section, listing industry and allied trades in Great Britain, Scotland and Wales. Another feature is the more extensive use of celluloid thumb-index tabs. The various classifications of material and equipment listed are indicated by blue tabs. Red tabs are used to indicate Contents, Who's Who and Geographical Sections.

Books Received

Isolierte Leitungen und Kabel. By Dr. Richard Apt. Berlin: Julius Springer. 235 pages, illustrated. Price, 13 marks.

Hilfsbuch für die Elektrotechnik. By Dr. Karl Strecker. Berlin: Julius Springer. 1,137 pages, illustrated. Price, 42 marks.

Archiv für Elektrotechnik. By Dr. Ing. W. Rogowski. Berlin: Julius Springer. 526 pages, illustrated.

Vestiges of Pre-Metric Weights and Measures Persisting in Metric System in Europe, 1926-1927. By Arthur E. Kennelly. New York: MacMillan Company. 189 pages. Price, $2.50.

Berechnung von Drehstrom-Kraftubertragungen. By O. Burger. Berlin: Julius Springer. 115 pages, illustrated. Price 7½ marks.

News of the Industry

Massachusetts for a Wide Rate Investigation

Regulative Procedure Recently Discussed by Legislature Will Await Results of Sweeping Inquiry by Department of Public Utilities

GOVERNOR FULLER of Massachusetts has signed a resolve providing for an investigation by the Department of Public Utilities of "ways and means for regulating in such manner as will be fair alike to the public and to gas and electric companies their rates, valuations and capital issues." In this connection the department will consider contractual relations between the companies and the state as recommended both by the commission and the Governor in their recent annual messages. The adoption of this resolve postpones action upon the regulative procedure lately under vigorous discussion in the Legislature of Massachusetts until next year.

Special "Home Rule" Session of Illinois Legislature

On the advice of Mayor Thompson of Chicago, Governor Small of Illinois has called a special session of the Illinois Legislature, which convened at Springfield on Wednesday, May 15. Two bills in the interest of "home rule" for Chicago are the only business to be considered. While the traction situation in that city provides the reason for the special session, one of the bills is in the form of an amendment to the Illinois Commerce Commission act by which a local commission with all the powers now held by the state body might be set up and a clause which now permits appeals to be made from a local commission to the state commission would be eliminated. This bill, if passed, will obviously affect all Chicago utilities. The local commission would, by the terms of the bill, be elected, or jurisdiction over utilities might be vested in existing city officials.

New Worcester Rate Survives Legal Technicalities

The 6-cent rate which the Worcester Electric Light Company had adopted, as reported in the ELECTRICAL WORLD for April 21, with the permission of the United States District Court, has been withdrawn from the tariffs on file at the State House, Boston, at the instance of the Massachusetts Department of Public Utilities, but is still in force in billing customers for service. The federal court had previously enjoined the commission from enforcing the maximum rate of 5 cents per kilowatt-hour ordered by the board last summer. The commission received a notification from the company some weeks ago that it proposed to establish a 6-cent rate in place of the former 7 cents beginning April 1. On that date bills began to be rendered on the 6-cent basis, and, according to a statement by President Robert W. Rollins to a representative of the ELECTRICAL WORLD, the company will continue to maintain the 6-cent rate unless it loses its fight in the courts against a lower tariff.

The Massachusetts commission, after deliberation, declined to sanction the compromise rate of 6 cents, evidently fearing that such action might from its point of view have an adverse effect upon the outcome of the case. Hearings are now progressing daily at Boston before Henry E. Warner, master, the company's side being first presented. The fundamental issue in the case is the method of ascertaining the rate base on which tariffs shall be made.

Morin Muscle Shoals Bill Passes House

Provision for Prepared-Fertilizer Manufacture Stricken Out—Boulder Dam Measure to Have Eight Hours' Time—Swing Assails Power Companies

BY A VOTE of 251 to 165, the House of Representatives on May 16 passed the Morin Muscle Shoals bill shorn of the clause providing for the government manufacture of fertilizer, in the place of which a provision for the manufacture of nitrogen alone was substituted. The Morin bill authorizes the government to operate its plants at Muscle Shoals and to sell both nitrogen and surplus power. The fertilizer clause succumbed to the avalanche of open attack upon it let loose by the National Fertilizer Association, which paid for full-page advertisements in Washington papers and brought scores of its members to the capital to work against the bill. The measure, which is similar to the Norris bill that passed the Senate, now goes to conference. Senator Norris indicated that no serious trouble is expected in reaching an agreement between the two houses.

The Snell substitute bill was defeated by a vote of 151 to 119. The Snell bill limited fertilizer manufacturing at Muscle Shoals to experimental work for a period of five years. An amendment offered by Representative Hoch of Kansas and aimed at the power section of the bill was passed by the House. It provides that the resale of power shall be regulated by the Federal Power Commission. Representative Quin of Mississippi, however, expressed the opinion that this amendment would be valueless because it constitutes a violation of state's rights. Other amendments adopted affecting this section include one introduced by Representative La Guardia of New York which grants preference to municipalities in the leasing of power and a committee amendment which insures that power shall not be leased in excess of the maximum amount needed for nitrogen fixation. Over the protest of Representative Byrne of Tennessee an appropriation of $2,000,000 was authorized to begin construction work on the Cove Creek dam during the next fiscal year. Provision for all dams below Cove Creek was stricken out of the bill.

For the Boulder Dam bill a rule has been granted allowing eight hours' time for its consideration on the floor of the House. The bill probably will come before the House next Tuesday. Representative Swing of California, co-author of the bill, has issued a statement protesting against activities of senators from Arizona and Utah in seeking to postpone consideration of the bill. Mr. Swing also took occasion to censor the power companies for their opposition to his bill. He declares, however, that "their fight will be less effective since the Federal Trade Commission exposure of their disguised activities and insidious use of 'undercover' methods in newspapers, colleges and chambers of commerce."

The President has signed the flood-control bill and appointed Carleton W. Sturtevant of New York as civil engineer member of the commission created.

Arkansas Utilities Association at Hot Springs

Members of the Arkansas Utilities Association, 250 strong, convened at Hot Springs, Ark., on May 14, 15 and 16 for the twenty-first annual convention of that body. The program dealt largely with the problems of light and power companies and with public relations. Among the prominent speakers were former Governor C. H. Brough, J. F. Owens of Oklahoma City, chairman of the Public Relations National Section of the N.E.L.A.; C. J. Griffith, vice-president Arkansas Power & Light

Company; Earl W. Hodges of Henry L. Doherty & Company; D. Dodson Lewis, secretary-manager Little Rock Chamber of Commerce, and F. Leslie Body, secretary-manager Hot Springs Chamber of Commerce. The retiring president, Robert M. Foster, Jr., vice-president Arkansas Utilities Company, Helena, made an official address. The election of new officers was to take place on Wednesday.

Trade Commission to Send Another Questionnaire

Information on Holding, Management and Service Companies Sought—More Information Bureau Men Heard—Municipal Propaganda Ignored

AN ADDITIONAL questionnaire is to be sent out by the Federal Trade Commission in connection with its utilities investigation. The additional schedules have been prepared and are now being studied by the commission. They call for comprehensive information upon (1) the growth of capital assets and capital liabilities of holding-company and management groups, including their public utility and non-public utility subsidiaries, and of independent operating companies doing an interstate business; (2) the methods of issuing, the price realized and the commissions, bonuses and fees received or paid by such companies with respect to the various issues of securities made by them; (3) the intercompany relationships among holding companies, managing or service companies and financial, engineering, construction and electric and gas operating companies, and (4) the services furnished to electric and gas public utility companies by holding, management and service companies, the expenses and earnings of such companies, together with the fees, commissions or bonuses charged by them or their subsidiary or affiliated companies.

Provision is also made in these schedules to obtain information concerning political campaign contributions and the expenditure of funds to be used to influence or control public opinion with respect to municipal or public ownership of electrical power enterprises. Representatives of the commission are now visiting the offices of certain large holding and service companies in New York City, Philadelphia and Chicago, acquiring data on the various phases of the inquiry from the official records of the companies. As soon as available other examiners will be sent to other power-company groups.

Examination of R. J. Holly of Sanford, Fla., director of the Florida Public Utilities Information Bureau; H. E. Simpson of Miami, treasurer of that bureau and also of the Southeastern Division, N.E.L.A., and Willard Cope, executive secretary of the Utilities Information Committee of Georgia, took up the May 10 sessions of the investigation of utilities. Nothing of a nature to attract public attention or special political attack was developed by the testimony of the Florida men. Mr. Cope told of his committee's fight in 1921 against water-power legislation sponsored by the Municipal League of Georgia. The bureau had spent an average of $30,000 a year, he testified, but all vouchers and financial records were destroyed at the end of each year as a matter of office routine. The discontinuance of the legislative agitation over water power in Georgia Mr. Cope attributed to the death in 1924 of John J. Eagan of Atlanta, its chief advocate. He testified regarding the circulation of a weekly news bulletin, *The Week*, and discussed the distribution of various pamphlets relating to public utilities.

When the commission resumed its sittings on May 15, Joe Carmichael, director of the Iowa Committee on Public Utility Information, was questioned about the efforts of that committee to influence instruction in the public schools concerning public utilities. This is a line of inquiry that the commission has consistently followed. Mr. Carmichael said that schoolbooks were removed by local school authorities when protest was made that they contained matter favorable to government ownership of power units. The protests were voiced by local managers of utility companies.

On Wednesday Thorne Browne, managing director Middle West Division, N.E.L.A., was examined regarding the distribution of textbooks and pamphlets to the schools of Nebraska and Missouri. Mr. Browne said that the object was to provide supplemental information not covered by school textbooks and to achieve "better understanding on the part of the rising generation of the scope and field of public utilities." He said he could see no impropriety in the use of impartial material in such a way. The fact that the supplier of this material may have had an interest to serve would make no difference if the material itself were right.

Officials of telephone and telegraph companies were then called in an effort to obtain a check on messages to and from the Washington offices of the Joint Committee of National Utility Associations. S. E. Boney of the North and South Carolina Public Utilities Information Bureau was summoned to give testimony on Thursday morning.

In denying a request made by Representative Douglas of Phoenix, Ariz., that the investigation include the "lobby" working in behalf of the Swing-Johnson bill for the development of Boulder Dam, Judge McCulloch, the member of the Federal Trade Commission in charge of the investigation, stated that the full commission "adheres to its conclusion that the province of this investigation is directed entirely to privately owned utilities and not to those municipally owned." "We are not concerned here with the merits of Boulder Dam, nor with any city or public project, but we are only concerned with the activities of privately owned utilities," Judge McCulloch said.

There will be no hearings next week, as Judge McCulloch will be absent from Washington.

Renewal of Demand for Curb on Federal Courts

Samuel Untermyer Wants Limitation of Their Jurisdiction in Rate Cases, Basing His Argument on Traction Situation in New York

PERMISSION granted by the United States District Court to the Interborough Rapid Transit Company of New York City to raise its fare from 5 cents to 7 cents has augmented the agitation for passage by Congress of a law limiting the jurisdiction of the federal courts in rate cases. Samuel Untermyer, special counsel for the city, last Saturday supplemented a memorial to Congress from the city's Board of Estimate by requesting Senators Copeland and Wagner, who represent New York State in the Upper House, to get behind legislation to this end.

Representative Loring M. Black of Brooklyn has a bill pending before the House judiciary committee which would amend the federal code by taking original jurisdiction in rate cases away from the federal courts. Under this bill, as under bills introduced by Representatives O'Connor and LaGuardia, the public utility companies would be required to bring their proceedings in the state courts. A bill including similar provisions has been fathered by Senator Norris in the other house. Utility companies would, of course, still have an appeal to the United States Supreme Court from the highest state courts.

Ten-Thousand-Dollar Arc-Welding Prize Awarded

Award of $17,500 in prizes for the best contributions to the arc-welding art was the outstanding event at the opening session of the spring meeting of the American Society of Mechanical Engineers at Pittsburgh on Monday of this week. These prizes were offered by the Lincoln Electric Company of Cleveland through its vice-president, James F. Lincoln, with the desire to promote the whole art and to reduce the cost of construction.

The first prize, $10,000, was awarded to James W. Owens of Newport News, Va., for a paper entitled "Arc Welding. Its Fundamentals and Economics." Prof. Henri Dustin of the University of Brussels, Belgium, received the second prize of $5,000 for his paper on "Fundamental Principles of Arc Welding," while Commander H. E. Rossell of the United States Naval Academy took the third prize of $2,500 for his review of "Electric Welding of Ship's Bulkheads and Similar Structures."

Seventy-seven papers were entered in the contest from twenty-five states and five foreign countries. Honorable mention was given to Frank B. Walker of Winthrop, Mass., and B. K. Smith of Houston, Tex.

There was a central-station power session of the society on Thursday, with papers by H. B. Brydon and George A. Orrok.

Ten Thousand Expected in Atlantic City

Many Prominent Men and Women from Outside the Industry Will Unite with Its Own Leaders to Address Delegates on Vital Present-Day Topics

SAVE for the names of two speakers to be added to those addressing the general sessions and for the exact titles of several others of the addresses promised, the program of the fifty-first convention of the National Electric Light Association, to be held at Atlantic City on June 4 to June 8 inclusive, is ready. The functions of holding and investment companies, interconnection, railroad electrification, rural service, research, advertising, merchandising problems and the commercial outlook will be especially prominent in the addresses and discussions, as will the absorbing present-day topic of "government and business." An imposing array of speakers will address themselves to these subjects, and a thoroughly successful convention is foreseen. The estimated attendance of delegates and visitors is ten thousand, representing every part of North America.

Speakers from outside the light and power industry will include Melvin A. Traylor, president of the First National Bank of Chicago, who will make the chief address on "public policy night"; Dan Moody, Texas' famous young governor, who will be the main speaker from the sphere of politics; Samuel M. Vauclain, president of the Baldwin Locomotive Works; J. E. Edgerton, president of the National Association of Manufacturers; H. P. Davis, chairman of the National Broadcasting Company's board; Lawrence A. Downs, president of the Illinois Central Railroad; Hugh Frayne, representing the American Federation of Labor; H. G. Wells, president of the National Association of Railroad and Utilities Commissioners; Deane W. Malott, assistant dean of the Harvard Graduate School of Business Administration; P. W. Pinkerton, president of the American Society of Certified Public Accountants; Clifford V. Gregory, editor of the *Prairie Farmer;* Miss Belle Sherwin, president National League of Women Voters; C. O. Ruggles, dean of the College of Commerce and Administration, Ohio State University; William P. MacCracken, Assistant Secretary of Commerce; Merle Thorpe, editor *Nation's Business;* John T. Madden, dean School of Commerce, Accounts and Finance, New York University; Mrs. John D. Sherman, president General Federation of Women's Clubs; David Himmelblau, School of Commerce, Northwestern University; S. N. Halliday, General Outdoor Advertising Company; Mrs. Anna S. Richardson, *Woman's Home Companion,* and Clayton Rand, president Dixie Press, Gulfport, Miss.

From the industry itself, to speak at the general or the sectional sessions, are listed President H. T. Sands, Managing Director Paul S. Clapp and Director of Engineering H. S. Bennion of headquarters; Chairmen J. E. Davidson, E. A. Davis, E. C. Stone and J. F. Owens of the Commercial, Accounting, Engineering and Public Relations National Sections respectively; A. W. Thompson, president United Gas Improvement Company; Britton I. Budd, president Public Service Company of Northern Illinois; Franklin T. Griffith, president Portland Electric Power Company; Dr. W. R. Whitney, director of research, General Electric Company; W. W. Freeman, president Society for Electrical Development; John F. Gilchrist, vice-president Commonwealth Edison Company; James H. McGraw, president McGraw-Hill Publishing Company; George N. Tidd, president American Gas & Electric Company; Herbert A. Wagner, president Consolidated Gas, Electric Light & Power Company; W. E. Mitchell, vice-president Georgia Power Company; Charles B. Scott, Earle W. Hodges, E. W. Lloyd and A. D. Bailey.

The usual ample reports will be presented by the well-known men who head the general and sectional committees, and the Coffin, Forbes and other prize awards will be made.

The exhibition is expected to surpass all previous ones, every foot of space on the Million-Dollar Pier not occupied by assembly halls, offices and special booths (including one for good-will and institutional advertising material) having been assigned to the 206 manufacturers who will make displays. B. A. Rolfe's orchestra has been engaged to provide music in aid of the excellent entertainment program under preparation. It will also play at the public policy eve-

N.E.L.A. Convention Program, Atlantic City, June 4-8

General Sessions

TUESDAY, JUNE 5, 9:30 A.M.

Address of welcome, Mayor Ruffu.
Address by President H. T. Sands.
Reports of treasurer, membership committee, managing director and of Public Relations Section.
"Why the Investment Company," A. W. Thompson.
"Broadcasting," H. P. Davis.

WEDNESDAY, JUNE 6, 9:30 A.M.

Reports of exhibition, codes and standards, and rate research committees and of Commercial Section.
"The Electric Utility and the Public," Henry G. Wells.
"Government and Business," John E. Edgerton.
"Universities and Industry," Dean D. W. Malott.
"Speeding up for Prosperity," S. M. Vauclain.

WEDNESDAY, JUNE 6, 2:30 P.M.

Forbes Magazine awards.
Symposium, "Railroad Electrification," B. I. Budd and L. A. Downs.
"The Accountant as a Torch Bearer to Management," P. W. Pinkerton.
Report of rural service committee.
"Electricity and the Farmer," C. V. Gregory.
"Power in Political Education," Belle Sherwin.

THURSDAY, JUNE 7, 9:30 A.M.

Reports of prize awards and lamp committees and of Accounting Section.
"The Clearing House of the Industry," F. T. Griffith.
"Education of Men for the Public Utility Industry," Dean C. O. Ruggles.
Address by Governor Moody of Texas.
"Electrical Research and Progress," Dr. W. R. Whitney.

THURSDAY, JUNE 7, 2:30 P.M.

Reports of educational committee and of Engineering Section.
"Teamwork for Electrical Development," W. W. Freeman.
"Commercial Aviation," W. P. MacCracken.
Address by Hugh Frayne.
"From Bottom up or Top Down," Merle Thorpe.
"The Investment Company in Business Development," J. T. Madden.

FRIDAY, JUNE 8, 9:30 A.M.

Reports of memorials, insurance and other committees.
Address by Mrs. J. D. Sherman.
"Electrical Advertising," J. F. Gilchrist.
Address by James H. McGraw.
"Interconnection with Its Benefits," George N. Tidd.
Appreciation, H. A. Wagner.
Election of officers.

Public Policy Committee

WEDNESDAY, JUNE 6, 8:30 P.M.

Presentation of Charles A. Coffin Award.
Report of public policy committee.
Address, Melvin A. Traylor.
Music and dancing.

Accounting Section

TUESDAY, JUNE 5, 2:30 P.M.

Address by Chairman E. A. Davis.
"Insurance Costs," Charles B. Scott.
"Common Sense and Dollars," E. W. Hodges.
"Accounting Treatment of Securities Discount and Expense," D. Himmelblau.
"Some Problems for the Accountant," E. W. Lloyd.
Reports of committees.

Commercial Section

TUESDAY, JUNE 5, 2:15 P.M.

Address by Chairman J. E. Davidson.
Address by Samuel N. Halliday.
Reports of committees.

Engineering Section

TUESDAY, JUNE 5, 2:30 P.M.

Address by Chairman E. C. Stone.
"Purposes and Accomplishments of Engineering Staff," H. S. Bennion.
"Organizing the Industry's Engineering Research," A. D. Bailey.
"Spending Our Company's Money," W. E. Mitchell.
"Engineering for the Future," E. C. Stone.

Public Relations Section

TUESDAY, JUNE 5, 2:30 P.M.

Address by Chairman J. F. Owens.
"Woman's Place Is in the Home," Mrs. A. S. Richardson.
"Thunder and Lightning," Clayton Rand.
Reports of committees.

ning meeting, when there will be other music as well.

An open meeting for women delegates, with two sessions, will be held at the Dennis Hotel on Monday morning and afternoon, under the guidance of Miss Sophia Malicki. The session of the Commercial National Section will be held in the Haddon Hall Hotel and that of the Accounting National Section in the Hotel Traymore. All other sessions will be on the Million-Dollar Pier.

"Electrical World's" London Letter

Central England Electricity Scheme Announced—British Industries Fair and Electrical Trade—"House of the Future"—Cable-Wireless Merger

By Bernard C. Holding
Editor of *The Electrician*

London, April 28, 1928.

Outstanding in importance among electrical items of early spring was the publishing of the proposed electricity scheme for operation under the Central Electricity Board for the central England area. This constitutes the third scheme so far published, the other two covering Scotland and southeast England. The proposed arrangements for central England embrace an area of approximately 7,000 square miles, including virtually the whole of the industrial zones of the Midlands, and they comprise the whole or the major portion of the areas of supply of 49 existing authorized electricity supply undertakers. The sale of electricity in the area in 1926-27 by all the undertakers concerned was 762,000,000 kw.-hr., equal to about 146 kw.-hr. per head of population according to the 1921 census. A rate of growth has been taken as the basis of estimates for the scheme, which would give a sale in 1934-5 of 1,890,000,000 kw.-hr., or 362 kw.-hr. per head. It is expected that by 1940 the output will have reached 2,820,000,000 kw.-hr., or 540 per head. Of the 46 generating stations at present operating in the area, it is proposed that 19 be taken as "selected" stations, while six others will be used as temporary stations. The remaining 21 stations will be gradually closed down as generating stations and made into transformer stations. The total expenditure in the Midlands scheme may be given as about £7,500,000 during the first six years, while the saving to the authorized undertakers is put down as about £1,500,000.

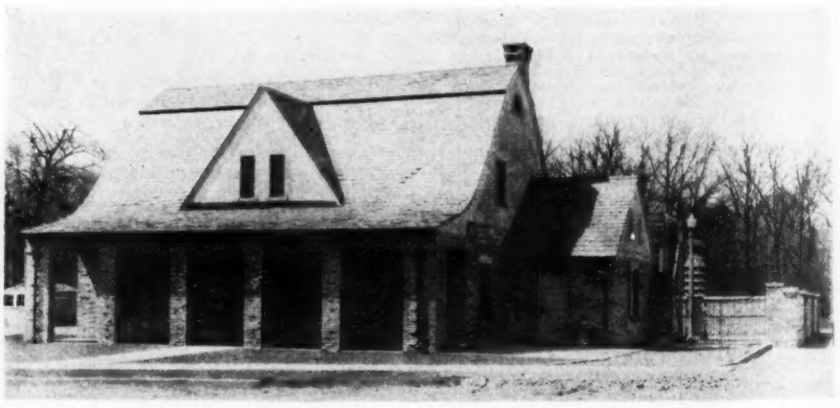
Another interesting feature of last month was the closing of the British Industries Fair, at Birmingham and London, for another twelve months. The electrical section of the fair was again very successful, no single instance having been heard in which the fair was thought to be not worth while; in fact, the immediate success of the exhibition as a promoter of trade has been greater than some exhibitors anticipated.

Still another successful exhibition during March, in which the electrical industry played a not inconsiderable part, was the "ideal home exhibition" held in London. Here was shown an example of the house of the future. Lighting, heating, cooking, cleaning and services of every description were all electrical, and from the time one entered the garden it was practically impossible to find anything which was not in some way associated with electricity.

With regard to the announcement during March of the fusion provisionally arranged between the Eastern & Associated Telegraph Companies and Marconi's Wireless Telegraph Company, this does not necessarily mean that the problems of either party are entirely solved. It is not in any way certain at present that a satisfactory agreement with the British government and the governments of the Dominions and Canada can be arrived at, although no suitable alternative seems possible. Government control of telegraphic communication has not, on the whole, proved profitable; the general feeling is therefore that the Post Office may not be anxious to hand over those enterprises, including the "beam" service, which are understood to be making a profit. Be this as it may, the final decision must rest with the Imperial Wireless and Cables Conference, which is thus confronted with as heavy a responsibility as any commission in recent years has had to bear. The world has eagerly paid tribute to the genius of Marconi and the wonders that have evolved through his organization. Justice, however, suggests recognition of the fact that the Marconi enterprise is scarcely 30 years old, while the cable has been facilitating and expediting the progress of the world for about 80 years. When, in 1851, Brett laid his Dover-Calais cable, after a fierce struggle to secure the £300 necessary for the experiment, it may be said, however, that he scarcely anticipated the amazing expansion of cabling, with its record of brilliant achievements.

On the personal side it is interesting to note that Sir Oliver Lodge, F.R.S., was admitted a freeman of the city of Stoke-on-Trent, his birthplace, while Sir Alexander Kennedy, F.R.S., celebrated his eighty-first birthday on March 17. George Offor, an electrical pioneer, celebrated his one hundred and first birthday on March 30, and on the same day a jubilee dinner was given to Col. R. E. Crompton to commemorate the founding of Cromptons, Ltd., 50 years ago. J. M. Gatti was elected chairman of the British Electrical Development Association, and it was announced that Dr. J. A. Fleming, F.R.S., is to be awarded the honorary degree of doctor of engineering by Liverpool University in May. Among those this month whose loss will be widely felt are Sir William B. Forwood, one of the founders of the Liverpool Overhead Railway Company, and John P. Hooper, who superintended the manufacture of cables which were laid between Para, Pernambuco, Bahia and Rio de Janeiro from 1872 to 1875.

Unique Substation in Residential Part of South Bend



The unusual type of substation building shown here was erected not long ago by the Indiana & Michigan Electric Company to serve South Bend from the company's 27,000-volt loop around the city. Building restrictions made it obligatory to design a building that would largely conceal the electrical apparatus and enhance rather than depreciate the value of the adjacent lots. The building is 30 ft. wide by 40 ft. long, built of brick with a slate roof of varied colors. The windows and doors are equipped with shades and curtains similar to those of any fine residence. From the street it has the appearance of a bungalow. There is 200 ft. of underground construction connecting it with the overhead loop. The station contains four 1,000-kva., 27,000/2,500-volt single-phase transformers, three for service and one as a spare. The 27,000-volt apparatus is out of doors back of the substation building and surrounded by a brick wall such as might surround a garden.

Purchases and Mergers

Plans Mature for the Acquisition of the Brooklyn Edison Company by Consolidated Gas—Merger of Penn-Ohio Edison and Northern Ohio Power Becomes Effective

OUTSTANDING this week in news involving changes in the control of light and power companies is the approval by both the trustees of the Consolidated Gas Company of New York (which controls the New York Edison and its associated companies) and the directors of the Brooklyn Edison Company of the plan mooted for some time for the acquisition of the latter by the former, thus bringing all the Brady electrical interests in Greater New York under a common management. When this plan shall have been indorsed by the stockholders of the respective companies, the only electric light and power companies of size in the metropolitan area not included in the consolidated group, whose capitalization will exceed $1,343,000,000, will be the Long Island Lighting Company and the Staten Island Edison Corporation. Details of the proposed financial arrangement are printed under "Financial and Statistical" (page 1039).

The merger of the Penn-Ohio Edison Company and the Northern Ohio Power Company, noted in the ELECTRICAL WORLD for April 21 (page 829) as under negotiation, was declared effective on May 15.

No opposition was made on May 9 before the New York Public Service Commission to the petition of the New York Power & Light Corporation to acquire the Ticonderoga Electric Light & Power Company or to the petition of the Mohawk-Hudson Power Corporation to acquire the Cortland County Traction Company, which does a light and power business. The decision of the commission was reserved.

Purchase of the Ardmore Light & Improvement Company by the Annapolis & Chesapeake Bay Power Company, a subsidiary of the Consolidated Gas, Electric Light & Power Company of Baltimore, has been approved by the Maryland Public Service Commission.

A petition asking authority to purchase electric transmission lines and property in seven Indiana counties, including Marion County, has been filed with the Indiana Public Service Commission by the Southeastern Indiana Power Company of Indianapolis. The lines in question belong to the Evans Electric Company, the Eastern Light & Power Company and the Suburban Power & Light Company. The petitioning company asks to be declared a public utility.

The Interstate Public Service Company of Indianapolis has been authorized by the Indiana Public Service Commission to pay $35,000 for the properties of Frank Crull, known as the Home Light & Power Company, at Mooreland, Millville, New Lisbon, Ashland and Messick.

The North Dakota Railroad Commission has authorized the Otter Tail Power Company to purchase the Clyde Electric Company and the Page Electric Company. A recently printed report that the Otter Tail company had bought the Eckelson (N. D.) plant was erroneous. A proposal to sell the electric distribution system at Williston, N. D., to the Montana-Dakota Power Company was defeated at a special election by a margin of 299 votes. Williston has 4,000 people.

To the Great Western Power Company of California permission has been granted by the Railroad Commission to purchase all of the outstanding stock of the Fair Oaks Electric Company and to consolidate the property with its own system. The company, which has been purchasing its energy from the Great Western, serves a district 12 miles northeast of Sacramento. The Great Western was directed to charge to capital account not more than $28,736 of the purchase price, excess indebtedness of the Fair Oaks company to be charged to profit and loss.

Several utilities at Ketchikan, Alaska, have been purchased by the W. B. Foshay Company of Minneapolis, including the Citizens' Light, Power & Water Company, and are to be merged as soon as possible with other public utility holdings of the Foshay company.

Consummation of the arrangement by which financial interests represented by Nesbitt, Thomson & Company, the Power Corporation of Canada, Sir Herbert Holt, Lord Rothermere, the Canadian & Foreign Power Corporation, J. H. Gundy and Andrew Holt & Company are to take ownership of the British Columbia Electric Railway Company is announced.

Chamber of Commerce Adopts Resolutions

Denounces Unethical Practices and Corruption of Public Servants—Declares Against Government in Business and Against Limiting Power of Federal Courts

A RECORD-BREAKING attendance, the presence of scores of industrial leaders of the first rank from all parts of the country, the high character of the addresses, the willingness shown to exercise guidance in the ethical, economic and legislative problems that confront business, and the determination

William Butterworth

evinced to make American industry worthy of the pre-eminence it has achieved among the factors that control the social life and progress of the nation, combined to make the sessions of the Chamber of Commerce of the United States that closed at Washington on May 11 the most memorable yet held by that body. Before adjourning, the chamber, some of whose proceedings with a special bearing on the electric light and power industry were reported at length in last week's ELECTRICAL WORLD, adopted seventeen resolutions.

In one of these resolutions, based on the keynote address of Judge Edwin B. Parker, unethical practices in business were condemned and stockholders were told that they "cannot accept the profits flowing from corruption and escape the moral stigma which inheres in such profits." This resolution declared further that American business "insists upon protecting its professional status by the maintenance of the highest standards and intends scrupulously to discharge its collective responsibilities." "The moral turpitude of corrupters of public servants is even greater than that of those whom they debauch," the resolution said:

Another resolution dealt with "government and business," specifying "transportation and communication" as fields the government should not enter. This resolution reads:

> The very essence of civilization is that there be placed upon the individual only that degree of restraint which shall prevent his encroachment upon the rights of others, thus releasing to the utmost individual initiative in every proper direction. Our form of government most effectively expresses and maintains this principle. Within our basic law exists ample provision for such changes as may from time to time be necessary to safeguard our people. It is, therefore, essential that our government should scrupulously refrain from entering any of the fields of transportation, communication, industry and commerce, or any phase of business when it can be successfully undertaken and conducted in the public interest by private enterprise. Any tendency of government to enter such fields should be carefully weighed in the light of its possible effect upon the very genius of our institutions.

Other resolutions passed opposed limitation of the power of the federal courts and advocated a reduction in the corporation tax to 10 per cent, improvement of federal tax laws and administrative regulations, the application of the budget system to state and local expenditures, legislation for the encouragement of shipbuilding by responsible private interests, extension of the Webb-Pomerene act to include import associations, compilation of more comprehensive industrial statistics, enactment of the Hague rules for ocean bills of lading in so far as applicable to America, and international commercial arbitration.

The board of directors elected the following officers for the ensuing year: Chairman of the board, Joseph H. Defrees of Chicago; president, William Butterworth, Moline, Ill.; vice-president Eastern Division, Alfred J. Brosseau, New York; vice-president South Central Division, Robert R. Ellis, Memphis; vice-president North Central Division, Robert P. Lamont, Chicago; vice-president Western Division, Paul Shoup, San Francisco.

Merger Movement Fundamentally Sound

President of Middle West Division, N.E.L.A., Points Out How Individual Operating Companies Benefit from It—Public Relations and Commercial Development

UNSWERVING determination on the part of electric utility executives, operators and employees to stand for and demand complete vindication of their industry overshadowed all else at the sixth annual convention of the Middle West Division, N.E.L.A., held in St. Louis on May 9-11.

Utility men must realize that they are living in a day when all businesses are in a melting pot of mergers and consolidations, said Don M. Sterns, president of the division, at the opening session. Fundamentally and economically this movement is sound, and in the central-station industry, through holding-company operation, individual companies have benefited directly by being able to do cheaper financing, install better and more efficient equipment and in turn reduce rates to the public. This has been possible in spite of the fact that costs of labor and materials for producing electricity have increased in line with other commodities.

The importance of the electrical industry and electrical service to a metropolitan city was emphasized in the address of welcome by Mayor Victor J. Miller, who pointed out that of $87,000,000 to be spent in St. Louis on civic improvements in the next five years between $8,000,000 and $9,000,000 will be for electrical improvements.

J. F. Owens, chairman Public Relations National Section, outlined the functions and purpose of his various subcommittees and made a plea that utility executives get a fuller appreciation of value of service on association committees.

The condition of farmers is of direct concern to utilities and the principal problem of the Middle West, declared F. J. Hanlon, Mason City, Iowa. He pointed out that there are many parallel conditions when utilities and farming are considered as businesses. Both have high investments, a low rate of capital turnover and high taxes, with problems of quantity production.

Speaking on "Some Fundamentals Under Government," Carl D. Jackson, chairman of the national committee on co-operation with educational institutions, declared that the utilities have a constitutional right to organize and engage in publicity for self-preservation.

H. T. Sands, president of the national body, in his address on "The Full Measure of Service," said that the greatest danger is from the public utility man who believes his public relations work is all done. He is due for a rude awakening.

Louis H. Egan, president Union Electric Light & Power Company, reviewed the developments in public utility financing in the Middle West, pointing to the changed conditions as compared with the early years of the industry, when utilities were financed partly by promoters and partly by electrical manufacturers.

That the sale of more electric service to existing customers is one of the best means of building better public relations was emphasized by J. E. Davidson, chairman Commercial National Section, N.E.L.A., who addressed the meeting on "Commercial Developments in the Electrical Industr·." Commercial activities in the Middle West were traced by W. J. Krug, chairman of the division's Commercial Section, who pointed out to commercial men that their plea of lack of executive interest in commercial activities may be due largely to the commercial man's own failure to present his story in complete and tangible form to his executive.

Public utilities are taking more and more active interest in rural electrification, C. F. Stuart, Northern States Power Company and chairman national rural electric service committee, asserted. Soon to be published by Mr. Stuart's committee will be a report on "Four Years' Operation of the Red Wing Line," which it is expected will provide an affirmative answer to the question whether electricity pays its way or not on the farm.

Discussing some phases of "Government in Business," Judge C. W. Appleton, vice-president General Electric Company, declared that the present form of state regulation of utilities is in the best interest of the public and the companies themselves and pointed out difficulties that would be encountered if some method of federal regulation were undertaken instead.

Training of utility employees to engage in public speaking as part of the utilities' public relations program was considered vitally important by W. S. Vivian, chairman N.E.L.A. public speaking committee. J. B. Sheridan, director of Missouri Committee on Public Utility Information, in an address on "Telling the Public," outlined the work of his committee.

"The Banker's Point of View" was the subject of an address by A. C. Allyn, president A. C. Allyn & Company, on Friday morning. Relations between utility operators and the banker have changed greatly in the last eight years, he said. From a combative attitude which formerly existed both the banker and the operator have come to realize that the interests of the utility owner, the operator, the banker and the investing public are the same. Mr. Allyn traced the decreasing cost of investment money for utilities over the last few years and prophesied that interest rates would probably go lower than they are today and that many companies will be able to put out bonds bearing 3½ per cent coupons.

"Superpower—What Is It?" was the subject of an address by E. S. Hight, chief engineer North American Light & Power Company, who described in detail the development of electric service in the Middle Western States. Other addresses on Friday morning were on "Flood Control," by Major George R. Young, and "The Poetry of Power," by the Rev. W. C. Timmons, St. Louis.

The annual banquet and carnival held on Thursday evening was attended by about four hundred members and guests. At the close of the meeting the following officers were elected for the ensuing year: President, R. T. Smalley of the Kansas Electric Power Company; vice-presidents, A. E. Bettis of the Kansas City Power & Light Company, K. R. MacKinnon of the Nebraska Power Company and E. F. Buhlman, of the Iowa Southern Utilities Company; managing director, Thorne Browne.

Briefer News

UNITED LIGHT & POWER MOVES FROM GRAND RAPIDS.—The home office of the United Light & Power Company was moved early this month from Grand Rapids, Mich., to Chicago, whence all of the administrative and executive functions of the company will be directed. The new address is 2200 Bankers' Building.

CENTRAL MAINE POWER REDUCES RATES.—The Central Maine Power Company is proceeding with a general revision and standardization of rates throughout its territory. The latest change is a reduction affecting the southern division beginning June 1 and averaging 10 per cent. It will include customers in Bath, Brunswick, Lisbon and ten or twelve smaller places.

NEW IRRIGATION AND POWER DAM IN MEXICO.—President Calles of Mexico last week laid the first stone of the Tepuxtepec Dam, to be constructed in the State of Michoacan jointly by the Mexican Light & Power Company and the Mexican government. It will cost $10,000,000 and permit the generation of 30,000 hp. in addition to the irrigation features of the project.

ELECTRICAL AND ENGINEERING BUILDING FOR TORONTO EXHIBITION.—The first sod on the site for a new electrical and engineering building at the Canadian National Exhibition, Toronto, was turned by Mayor McBride on May 4 in the presence of a large gathering. The structure will cost upward of $500,000. All space has been already leased for a term of years.

NEW GENERATING PLANT FOR EVANSVILLE, IND.—A two-million-dollar steam-electric power plant is to be built in Evansville, Ind., by the Southern Indiana Gas & Electric Company. Work on the plant will start at once, and it is expected to be ready for operation by the fall of 1929. The plant will be built on the Ohio River in the part of Evans-

ville known as the West Side on a site of 20 acres just purchased by the company. The new plant will be linked with the Division Street plant, which will be kept in operation and used as the main distribution station. The first unit to be installed will have a rating of approximately 22,500 kw., and an ultimate station capacity of five times as much is provided for.

PROGRESS ON NEW MUNICIPAL PLANT AT HAMILTON, OHIO.—Electricity will be generated at the new municipal electric light plant of Hamilton, Ohio, in September or October, according to a forecast just made by F. H. Froehlich, the engineer who drew plans for the plant. The plant, complete, will cost $750,000, according to Mr. Froehlich's estimate.

EAST RIVER PLANT OF NEW YORK EDISON COMPANY INSPECTED BY ELECTRICAL SOCIETY.—Seven hundred members of the New York Electrical Society visited the new East River generating station of the New York Edison Company last Saturday and were escorted through the plant, speeches being made by Dr. E. E. Free, president of the society, and Vice-Presidents Thomas E. Murray, John W. Lieb and Arthur Williams of the company.

INTENSIVE DEVELOPMENT PLANNED FOR TIDEWATER VIRGINIA.—The development in tidewater Virginia of six electrical divisions, with centers respectively at Waverly, West Point, Urbanna, Chicoteague, Onley and Colonial Beach, is planned by the Virginia East Coast Utilities Company, according to President W. F. Stevens. Surrounding communities will be linked to these central points and considerable territory hitherto without service will be supplied.

CALGARY POWER COMPANY GETS BOW RIVER SITE.—The Calgary Power Company of Calgary, Alberta, has obtained a lease of the water-power site on the Bow River at its junction with the Ghost River (ELECTRICAL WORLD, May 5, page 934), an announcement from Ottawa says. Application for this site was in the nature of an alternative to the development of Spray Lakes power, which is left in abeyance. It is asserted that the additional power to be had from the Bow River will take care of the requirements of the Calgary Power Company during the next five years.

COMMISSION GIVES PUBLIC SERVICE COMPANY OF COLORADO A MONTH TO FILE ROYAL GORGE BRIEF.—After hearing testimony from municipal officials of Cañon City, Colo., in favor of the application of the Public Service Company of Colorado for permission to erect a power plant in the Royal Gorge, the Public Service Commission of the state gave the company thirty days in which to file a brief. This time will expire two weeks hence, after which final argument will be heard and the decision rendered. Engineers, ranchmen, farmers and fruit growers, who fear interference with water supply, as well as those who fear injury to the scenic attractiveness of the gorge, have opposed the application.

HYDRO PLANT CONTEMPLATED IN KENTUCKY TO SERVE MINES AND POWER COMPANIES.—A permit for which L. E. Bryant of Roberta, Tenn., has applied to the Federal Power Commission would allow him to construct two power dams on the Rock Castle and Laurel Rivers in Kentucky. The power would be used in coal operations and the surplus sold to power companies in the vicinity. The estimated installed capacity contemplated is 39,300 hp. The two dams would store 20,000,000,000 cu.ft. of water.

CONDITIONS GOOD IN SOUTHEAST FOR HYDRO GENERATION. — Water supply and stream conditions as they affect hydro-electric power in the Southeastern States are the best in years, according to reports made by representatives of the power concerns in the territory who met last week at Raleigh, N. C. The meeting was that of a committee on operations, composed of officials of the larger power companies in Virginia, West Virginia, North and South Carolina, Georgia, Alabama and Tennessee. It was brought out that reservoirs are in better shape and stream flow better than at any time in recent years at this season of the year. With normal rains throughout the summer no shortage of power is expected and it will probably not be necessary to plan extensive interchange of energy.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see ELECTRICAL WORLD for Jan. 7, page 80.]

Indiana Electric Light Association (jointly with Indiana Public Utilities Association) — Columbia Club, Indianapolis, May 22-24. William Stokes, 1548 Consolidated Bldg., Indianapolis.

National Electric Light Association—Atlantic City, June 4-8. P. S. Clapp, 420 Lexington Ave., New York.

American Association of Engineers—Hotel Hussman, El Paso, Tex., June 4-6. M. E. McIver, 63 E. Adams St., Chicago.

Electrical Supply Jobbers' Association—The Homestead, Hot Springs, Va., June 5-8. E. Donald Tolles, 165 Broadway, New York.

National Electrical Manufacturers' Association—The Homestead, Hot Springs, Va., June 11-15. S. N. Clarkson, 420 Lexington Ave., New York.

Pacific Coast Division, N.E.L.A.—Hotel Huntington, Pasadena, Cal., June 12-15. S. H. Taylor, 447 Sutter St., San Francisco.

Georgia Electrical Association—Savannah, June 14 and 15. J. J. McDonough, Georgia Power Co., Dublin, Ga.

Northwest Division, N.E.L.A.—Portland, Ore., June 19-22. B. Snow, 1208 Spalding Bldg., Portland, Ore.

Canadian Electrical Association—SS. "Richelieu" from Montreal to Saguenay and return, June 20-23. H. M. Lyster, 712 Power Bldg., Montreal.

American Institute of Electrical Engineers—Cosmopolitan Hotel, Denver, June 25-29. F. L. Hutchinson, 33 West 39th St., New York.

Association of Iron and Steel Electrical Engineers—Hotel Stevens, Chicago, June 25-28. J. F. Kelly, Empire Bldg., Pittsburgh.

American Society for Testing Materials — Chalfonte-Haddon Hall, Atlantic City, N. J., June 25-29. C. L. Warwick, 1315 Spruce Street, Philadelphia.

East Central Division, N.E.L.A.—Cedar Point, Ohio, July 10-13. D. L. Gaskill, Greenville, Ohio.

NEW HYDRO DEVELOPMENT FOR WASHINGTON COAST. — Authority to proceed with the construction of a concrete dam across the North River near Brooklyn, Wash., just given by the Federal Power Commission, permits the Western Washington Electric Light & Power Company of Raymond to begin work on its hydro project, where it is said as much as 70,000 hp. may be generated. The federal permit was necessary owing to the fact that the North River, tributary to Willapa Harbor, is navigable in certain sections.

FLOODS SWEEP A SMALL QUEBEC PLANT AND THREE DAMS AWAY.—The power plant of the Vanchesteing Electric Power & Light Company, at St. Jovite, Quebec, valued at $30,000, was washed away by floods which swept through the northern section of the Laurentian district recently. The floods resulted from the breaking of three power dams under the pressure of waters released by the melting of snow and ice. St. Jovite is about 75 miles north of Montreal.

TO HARMONIZE SUBSTATION WITH PUBLIC BUILDING ARCHITECTURE.—The Union Electric Light & Power Company of St. Louis has awarded a contract for a substation to be erected on Clark Avenue, west of Fourteenth Street, at a cost of $200,000. The structure will be equivalent in height to an ordinary three-story building and has been designed to harmonize architecturally with the municipal and state building fronting on the St. Louis Memorial Plaza. The exterior walls will be of Bedford stone.

TENNESSEE COMPANY FILES HOLSTON RIVER APPLICATION. — The Tennessee Eastern Electric Company has filed application with the Tennessee Railroad and Public Utilities Commission to construct a dam and hydro-electric plant on the Holston River. The company agrees that the project shall be started within eighteen months after the issuance of the permit and shall be completed for operation within three years. It will cost $5,200,000. The dam, on the south fork of the Holston, would form a reservoir extending 8 miles up the Holston and 4 miles up the Wautauga River.

COURT DENIES INJUNCTION TO HALT HYDRO DEVELOPMENT ON KINGS AND SAN JOAQUIN RIVERS.—An injunction applied for by J. J. Stevenson, a corporation owning about fourteen thousand acres in Merced and Stanislaus Counties, Cal., and intended to restrain further development of power resources

by the San Joaquin Light & Power Corporation on the Kings and San Joaquin Rivers, has been denied in the Superior Court at Merced. The plaintiff claimed that the power company's development was an infringement upon its rights to a continuous flow of these streams. If granted, the injunction would have affected the Crane Valley, Kerckhoff and Balch plants.

NORTH CENTRAL DIVISION WILL NOT HOLD CONVENTION THIS YEAR.—The North Central Electric Association, geographic division of the N.E.L.A., has decided to hold no convention this year. Instead it will hold conferences during the year in various parts of the district. The next of these—a managerial conference—will be held at Breezy Point Lodge, near Pequot, Minn., on June 15 and 16. Sixty reservations have already been made. Accounting, commercial and engineering conferences have already been held. The managerial conference will be the first of its kind to be held by this body.

MORE INTERCONNECTION IN NEW HAMPSHIRE.—Preliminary surveys have been started by the Utilities Power Company for a 33,000-volt transmission line extending from Melvin Village to Center Ossipee, N. H. This 11-mile line will form on its completion a connecting link between the Laconia division of the Public Service Company of New Hampshire, the Utilities Power Company, the Franklin Light & Power Company and the Tilton Light & Power Company. The three latter companies are controlled by the New England Public Service Company and are operated by the Public Service Company of New Hampshire with headquarters in Manchester. Another survey will be started at once for an interconnection between the Garvins Falls plant on the Merrimac River, south of Concord, and the Bristol plant of the Utilities Power Company. The distance is 35 miles.

INDIANA MEN MEET NEXT WEEK.—The Indiana Electric Light Association will hold its annual convention at Indianapolis on May 22, the day before the Public Utilities Association of the state convenes. President Robert M. Feustel of Fort Wayne will preside, and Thomas F. English, South Bend, president of the Great Lakes Division of the N.E.L.A.; G. C. Neff, vice-president Wisconsin Power & Light Company, and C. V. Sorenson, vice-president Attica Electric Company and chairman of the Indiana rural electrification committee, will speak, the two latter on rural electrification. Truman E. Heinton will discuss the Purdue University short courses. Before the Public Utilities Association John B. Malling of Hammond, Ind., will speak on "The Government in Business" and Morse Dell Plain will read a paper on "The Training of Supervisory Forces." A member of the Indiana Public Service Commission will be invited to address the meeting and a round-table discussion on utility advertising will be held.

Recent Court Decisions

COMPANY NOT ENTITLED TO DAMAGES WHEN COMPELLED TO REMOVE WIRES FROM VACATED ALLEY.—In Northern Indiana Gas & Electric Company vs. Merchants' Improvement Association the electric company showed that it had occupied an alley in the city of Hammond with poles and electric light wires erected under a franchise grant from the city to supply its inhabitants with electricity. The alley was vacated by order of the board of public works, and the association, as the owner of abutting lots, brought action to enjoin the company from maintaining its poles and wires on the premises. The trial court found that the company should be enjoined from maintaining its poles and wires and that it was not entitled to damages because it was compelled to remove them from the vacated alley, and the Indiana Appellate Court has sustained this finding. (160 N.E. 50.)*

EVIDENCE TO SHOW NEGLIGENCE ON TWO COUNTS, NOTWITHSTANDING ADMISSION OF ONE OF THEM BY DEFENDANT, NEED NOT INVALIDATE TRIAL.—Sustaining a judgment for injuries to a boy from a fallen wire (Martin vs. Pacific Gas & Electric Company), the Supreme Court of California found that a charge of negligence against the company based not only on its failure for several hours to remove the wire from the sidewalk where it fell but also on alleged failure to maintain it properly before it fell was not prejudicial or inflammatory. The defendant was willing to admit liability on the charge of not removing the fallen wire and contended that subsequent admission of testimony on this as well as on the unadmitted charge of faulty maintenance led to excessive damages being fixed by the jury. The Supreme Court held that the damages—$25,000—were not as a matter of law excessive, the boy having suffered what appeared to be great and permanent injury. (264 Pac. 246.)

WATER-POWER RIGHTS PERMIT INCREASED USE IN PUBLIC INTEREST.—When a hydro-electric utility finds it necessary to reconstruct its plant and appropriate additional water in order to maintain a service adequate to meet the demands of the public, such expansion does not interfere with the original water-power rights of the operator. This is a decision of the Hood River County (Ore.) Circuit Court involving water rights of the People's West Coast Hydro-Electric Corporation acquired from the West Coast Power Company. In 1919 the People's West Coast company reconstructed the plant and increased its power capacity. Before this was done the State Fish Commission issued an order closing Herman Creek to further appropriation except for the purpose of fish culture, and this suit was instituted by the commission in an effort to cancel the utility's water rights on the ground that the company violated the provisions of its original application by reconstructing and altering its plant and appropriating more water than the initial permit called for. The greater interests of the public must prevail in such instances, the court held.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

COMMISSION RULES GOVERNING TRANSMISSION LINES ARE NOT APPLICABLE TO PRIVATE ROADWAY.—The Central Illinois Coal Mining Company brought action against the Illinois Power Company in the Illinois Appellate Court on the ground that an award of $14,100 under the workmen's compensation act was made against the plaintiff for the death of one of its employees who was killed when a 12-ft. pipe he was carrying came in contact with the power company's high-tension line at a height of 12 ft. over a roadway used by the victim. The coal company alleged that the employee's death was caused by the negligence of the power company in constructing and maintaining its line at an altitude lower than that required by the Illinois Commerce Commission. Sustaining the judgment of the trial court, the Appellate Court held that the rules and regulations of the commission prescribing the minimum height of wires did not apply to wires over private property and that the roadway in question, not being a highway, street, alley or right-of-way, came under that designation.

Commission Rulings

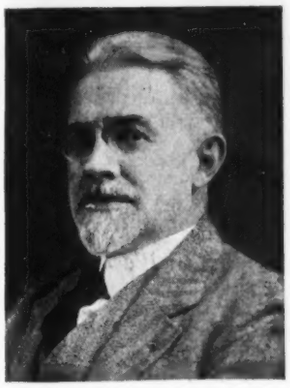
HIGH BILL SHOULD BE ADJUSTED IN CASE WHERE METER WAS READ AFTER ITS REMOVAL FROM DEMOLISHED BUILDING.—The New Jersey Board of Public Utility Commissioners has decreed, in settling a complaint made against the Atlantic City Electric Company by the Dixie Candy Company, that an adjustment should be made of an unusually high bill covering a period when service was not received and based on the reading of a meter after its removal by house wreckers because of the failure of the utility company to read and remove it upon receiving notice that the building in which it was installed would be torn down. The board said it would not permit a discontinuance of service if, in payment of future bills, the consumer deducted an amount already paid under protest in excess of what the board had approved as a reasonable charge, the commission lacking authority to order a cash refund of the excess.

APPLICATION OF REPRODUCTION-COST THEORY TO LAND VALUES.—In authorizing an issue of bonds and capital stock under certain restrictions by the United Electric Power Company the Rhode Island Public Utilities Commission considered the cost of reproduction new less depreciation only for the purpose of determining whether the amount of capitalization for which authorization was sought bore a relation to or was in excess of its fair value. In the matter of land values the commission said: "We believe a proper application of the cost-of-reproduction theory is a determination by appraisal of the value of each parcel in accordance with the market value of other land similarly situated in the same locality and enjoying similar public improvements, but without regard to the purposes for which the property is used. To this should be added the broker's commission which usually obtains where such land is located and an item of 1 per cent for other transfer costs, which we believe to be amply adequate for such costs under the testimony in this and other similar cases."

News About Men of the Industry

H. L. Doherty's Birthday Celebrated

Henry L. Doherty's fifty-eighth birthday was celebrated by his employees with an elaborate carnival at the Hotel Astor, New York, Tuesday, May 15, at which more than 1,800 members of the organization and their guests were entertained with a program lasting from



H. L. Doherty

4:30 p.m. to 1 a.m., utilizing the entire tenth floor of the hotel. A number of entertainers prominent in theatrical circles furnished the program of the evening. A telegram was received by Frank R. Coates from Henry L. Doherty expressing his pleasure at the celebration and his regret at not being able to be present.

Mr. Doherty, who is at the Battle Creek Sanitarium, Battle Creek, Mich., convalescing from his recent illness, was the recipient of many messages of congratulation and felicitation. Mr. Doherty is head of the firm of Henry L. Doherty & Company and president of the Cities Service Company.

HENRY MAULSHAGEN, district manager of the Alabama Power Company at Gadsden, has been appointed manager of that company's western division with headquarters in Birmingham. Mr. Maulshagen served as superintendent of the company's steam plant at Gadsden prior to becoming district manager.

H. O. CLARKE, JR., assistant general manager of the Houston Lighting & Power Company, Houston, Tex., was elected second vice-president and chairman of the electric section of the Southwestern Public Service Association at the recent convention held in Dallas. Mr. Clarke has been associated with the Houston properties for a number of years.

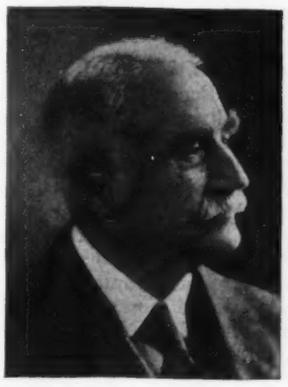
CLAUDE L. MATTHEWS, vice-president and treasurer of the W. N. Matthews Corporation, St. Louis, Mo., arrived in Los Angeles May 15 to address a meeting of the electrical industry of southern California held at the Hotel Biltmore, having left Chicago the preceding day by airplane. Mr. Matthews carried with him messages of felicitation and greetings from power companies and electrical manufacturers of both Chicago and St. Louis to the electrical fraternity on the Pacific Coast.

JAMES L. TONGE has been appointed distribution engineer of the Narragansett Electric Lighting Company, Providence, R. I.

WILLIAM H. LIPSCOMB, formerly president of the Habirshaw Cable & Wire Corporation, New York, has been elected president of the Dubilier Condenser Corporation to succeed Fred D. Williams. Mr. Lipscomb, who also served on the directorate of the Habirshaw organization, was at one time identified with the United States Steel Corporation.

C. F. Brush Honored by Franklin Institute

Charles F. Brush, engineer and inventor of Cleveland, was made the recipient on May 16 of the Franklin medal by the Franklin Institute of Philadelphia. This latest award is just another expression of esteem in a lengthy list of honors conferred upon Mr. Brush in the course of his scientific career. Among the outstanding examples of recognition are the decoration as Chevalier Legion d'Honneur (France) and the award of the Rumford medal by the American Academy of Arts and Sciences and the Edison medal by the American Institute of Electrical Engineers. Mr. Brush is especially noted for the Brush electric arc light, which he perfected and



C. F. Brush

gave to the world in 1878, the system first having been adopted by the city of Cleveland and subsequently extending to all parts of the world. Later he contributed many other fundamental inventions in both arc and incandescent lighting, storage battery and other devices.

R. P. Stevens President of New Utility Company

Ray P. Stevens, chairman of the board of Stevens & Wood, Inc., has been named president of the Allied Power & Light Company, the organization just formed from the consolidation of the interests of Hodenpyl, Hardy & Company, Inc., and Stevens & Wood,

R. P. Stevens

Inc. B. C. Cobb, vice-president of the Commonwealth Power Corporation and an operating official of other Hodenpyl and Hardy properties, will be chairman of the board of the new corporation.

Mr. Stevens has long been an outstanding figure in the electrical industry. After he had built and operated a large number of electric light and power plants in the South he then, in the capacity of consulting engineer, designed and constructed at Everett, Wash., an entire new railway and a light and power system, of which he became manager. Transferring his interests to the East, he spent several years in central New York before removing to Allentown, Pa., where, during an administration that covered a period of six years, he effected a consolidation of eighteen light and power companies, which resulted in great benefits to the communities served. In 1913 he resigned as president of the Allentown companies to become president of the Mahoning & Shenango Railway & Light Company and its subsidiary companies with headquarters in Youngstown, Ohio, and at the present time is president of the Penn-Ohio Edison Company, which has just taken over the Northern Ohio Power Company. Mr. Stevens has been active in association work, being president of the A.E.R.A. and a member of the A.I.E.E., the A.S.M.E. and other technical organizations.

RALPH P. ORMSBEE has been appointed assistant superintendent of distribution of the Narragansett Electric Lighting Company, Providence, R. I.

O. G. Thurlow Awarded Potts Medal

Oscar G. Thurlow, vice-president and chief engineer of the Alabama Power Company, was made the recipient of the Howard N. Potts medal by the Franklin Institute in recognition of his work in inventing the Thurlow backwater suppressor. The medal is awarded by the

O. G. Thurlow

Institute for distinguished work in science or the arts, important developments of previous basic discoveries, inventions of products of superior excellence or utilizing of important principles. This award is the second honor to be conferred upon Mr. Thurlow in recognition of his service to the study of science by the invention of the backwater suppressor and other engineering achievements. Last spring the University of Alabama conferred upon him the degree of doctor of science because of this accomplishment and because of his practical services in using it in the development of Alabama's resources.

Dr. Thurlow is a native of Massachusetts and a graduate of the Massachusetts Institute of Technology. He first came to Alabama in 1909 with the Tennessee Coal, Iron & Railroad Company and in 1912 he became associated with the Alabama Power Company. In addition to being vice-president in charge of engineering for this company he is also a member of the board of directors.

DAVID SARNOFF, vice-president of the Radio Corporation of America, sailed for Europe May 5 aboard the *Leviathan*.

GEORGE E. LEARNARD, president of the International Combustion Engineering Corporation, sailed for Europe aboard the Cunard liner *Aquitania* May 9.

E. L. CALLAHAN has been appointed general commercial manager of the Central Public Service Corporation with headquarters in Chicago. Mr. Callahan has had a long and varied experience in the electrical industry, his activities having extended into every department of the commercial side of central-station practice. Early in his career he was connected with Westinghouse, Church, Kerr & Company, the Simplex Electric Heating Company, the Prometheus Electric Company and the General Electric Company. So successful had he been in handling pioneer sales problems for the central station companies that he was selected by H. M. Byllesby & Company in 1909 to organize and direct the new-business department. He resigned six years later to become district manager of the Westinghouse Lamp Company in Chicago, subsequently being promoted to the position of sales manager of the company. Mr. Callahan has been active in association work, having been one of the founders and chairman of the Commercial Section of the National Electric Light Association and a frequent contributor to convention programs and to the technical press.

H. C. Blackwell Heads New Company

H. C. Blackwell, formerly president of the Union Gas & Electric Company, Cincinnati, has been named president of the new Cincinnati Gas & Electric Company, the organization resulting from the merger of the Columbia Power Company, the Cincinnati Gas & Electric Company and the Union Gas & Electric Company. Mr. Blackwell is well known in national engineering circles, both as an executive of long standing of electric light and power companies in the Middle West and as an officer in the representative engineering societies. His early connections included the Wabash Railroad Company, J. G. White & Company and the People's Light Company at Davenport, Iowa, advancing in the last-named company from engineer to the position of vice-president and general manager. As vice-president and general manager of the Kansas City Power & Light Company in charge of construction and operations, he was closely identified with the Kansas City development, one of the most successful

H. C. Blackwell

of the larger electric enterprises in the country.

In 1924 Mr. Blackwell removed to Cincinnati to become vice-president in charge of operations of the Union Gas & Electric Company, succeeding W. W. Freeman as president two years later.

Obituary

CHARLES E. MERRITT, assistant treasurer of the Commercial Cable Company, New York, for the past 27 years, died, of pneumonia, at his home in that city April 17. Mr. Merritt had been associated with the submarine cable industry in various capacities for the past 60 years. He was 82 years of age.

RAYMOND B. KEATING, vice-president of the West Penn Electric Company and its major subsidiaries, died May 12 after a brief illness. Mr. Keating was born in Pittsburgh in 1880 and spent the greater part of his business life in that city. Early in his career he was identified with the Philadelphia Company, the Electric Properties Company of New York, the Lackawanna & Wyoming Valley Railroad Company, the Electric Power Security of Niagara Falls, New York, owned and operated by the Westinghouse Electric & Manufacturing Company, and the Merchants & Manufacturers' Exchange of New York City. In 1914 Mr. Keating became vice-president of the West Penn System at its New York offices and in August, 1915, returned to Pittsburgh to continue his active duties with this company. At his death he was vice-president of the West Penn Electric Company, West Penn Railways Company, West Penn Power Company, as well as their subsidiaries. He was also a director and vice-president of the Monongahela West Penn Public Service Company of Fairmont, W. Va.

ROBERT WALES EMMONS, 2D, treasurer of the Lawrence (Mass.) Gas & Electric Company from 1903 to 1926, inclusive, died recently at Buzzards Bay, Mass.

ALVAH W. SULLOWAY, for many years president of the Franklin Light & Power Company, Franklin, N. H., died April 23 at his home in that city, in his 90th year. Mr. Sulloway was born in Framingham, Mass., and after schooling entered the hosiery manufacturing industry, with which he was connected a great part of his life. He organized and was president of the Franklin National Bank from 1879 until the time of his death. He was also president of the Franklin Savings Bank. For many years he was a director of the Boston & Maine and Maine Central Railroads, president of the Franklin Light & Power Company and the Acme Knitting Machine & Needle Company and a director and officer in other enterprises. Mr. Sulloway was also active in state politics.

Financial and Statistical News

Westinghouse Electric Sales Totaled $175,456,815

Sales of Westinghouse Electric Company for the year ended March 31 last were $175,456,815. Net manufacturing profit amounted to $14,000,000 and net income available for dividends $15,600,000. Earnings per share on the preferred and common stock amounted to $6.57, or 13.4 per cent. Dividends were paid during the year on both stocks at the rate of 8 per cent per annum, or $4 per share of $50 par value. This represents a slight decrease in business as compared with the previous year, when sales totaled $185,500,000 and earnings amounted to $6.80 a share.

As of March 31 the company's balance sheet shows current assets aggregating $122,000,000, which is more than eight times current liabilities. The sum of $3,000,000 representing a federal income tax reserve no longer required was restored to surplus.

Approximately $40,000,000 has been spent in the past six years for new plants and extensions. All plants have been provided with modern facilities, and the company is now in a position to take care of a business, at present prices, of more than 25 per cent in excess of this year's shipments. A statement of earnings, operating costs, interest charges, etc., in comparison with those of last year is shown in the accompanying table.

	1928	1927
Gross earnings	$175,456,815	$185,543,087
Costs	161,347,356	169,764,086
Net manuf. profit	14,109,459	15,779,001
Other income	3,031,704	2,585,614
Gross income	17,141,163	18,364,615
Interest, etc.	1,501,991	2,226,174
Net for dividends, etc.	$15,639,172	$16,138,441

Hartford Residential Service Analysis

The Harvard Graduate School of Business Administration, through its department of public utility management, has made an analysis of the residential electric business of the Hartford (Conn.) Electric Light Company covering the years 1914 to 1926, inclusive. After presenting the usual growth figures, the study proceeds to analyze by rate classification and by types of residential areas, giving actual billing records of the various groups, and includes particularly a study of the effect of promotional type rates and of appliance merchandising. For example, it was found that even in the better class of apartment house districts the use per customer was remarkably low. A commentary by Prof. Philip Cabot, reprinted from the *Annalist*, is appended. The report was prepared by J. Gardner Coolidge of the department's research staff; it is published as a 41-page pamphlet, of which copies are obtainable at a small charge from the department, Soldiers Field Station, Boston, Mass.

Penn-Ohio Edison Capital

On completion of the exchange of Northern Ohio Power common stock for Penn-Ohio Edison common under the merger plan capitalization of the latter will comprise: $5,999,000 6 per cent debentures, $8,151,800 7 per cent preferred stock, 49,229 shares 6 per cent preferred stock, 717,003 shares common, 119,270 option warrants for purchase of common at $25 a share and 166,650 option warrants for purchase of common at various prices up to $60.

Wyman Heads Portland Company

The New England Public Service Company has acquired from the National Electric Power Company substantially all the common stock of the Cumberland County Power & Light Company, Portland, Me. Out of 41,000 shares, only 35 are held outside. At a recent meeting of stockholders in Portland the following officers were elected: H. M. Verrill, chairman of the board; Walter S. Wyman, president; Fred D. Gordon, vice-president in charge of operations; F. D. True and George Otis Smith, vice-presidents; C. F. Berry, treasurer and clerk. George E. Haggas continues as chief engineer and Frank R. Fowles manager of the power and light department.

Billion Dollar New York Merger at Last Ratified

Brooklyn Edison Company Will Be Acquired by Consolidated Gas on Exchange of Stock if Stockholders and Public Service Commission Approve

THE long-anticipated and much-rumored merger of the Consolidated Gas Company of New York and the Brooklyn Edison Company has at last been ratified by the trustees of the former company and the directors of the latter. Conditions remaining to be fulfilled are: Approval of the Public Service Commission of New York, receipt of assent to the plan on the part of at least 70 per cent of Brooklyn Edison stockholders before June 15 and, of course, formal ratification by Consolidated Gas shareholders of capital structure changes necessary to accomplish the absorption. The plan involves acquisition of Brooklyn Edison common stock by Consolidated Gas on the basis of an exchange of one share common and one share $5 preferred of the latter company for one common share of the former.

Completion of the present merger plans will give Consolidated Gas Company of New York control of virtually the entire electricity and gas business of New York City, Westchester County and Long Island. The Brooklyn Union Gas Company, Staten Island Edison Corporation and Long Island Lighting Company remain independent. Reported heavy holdings by the Mellon interests in Brooklyn Union Gas and Consolidated Gas, as well as in United Gas Improvement of Philadelphia, suggest the possibility of a larger merger in the future.

From a statistical standpoint the present merger is one of large proportions. Assets of the Consolidated Gas system at the end of 1927 exceeded $842,000,000 and those of the Brooklyn Edison $170,000,000, bringing the total to more than $1,012,000,000. Gross revenues of the two systems for 1927 were $200,481,641. At current prices capital stocks of the group exceed $1,000,000,000. Combined net profits for 1927, after interest and taxes, amounted to $52,310,157. Connected horsepower of the Consolidated Gas system totals 3,450,000. Consolidated Gas properties last year sold 2,320,531,525 kw.-hr. and Brooklyn Edison sales were 754,635,609 kw.-hr., bringing the total to 3,075,167,134 kw.-hr. for the two systems. Combined earnings of the two companies will be equal to $4.04 a share.

A development which will probably follow the merger is the segregation of the gas and electric properties of the combined system with the formation of separate operating companies and a controlling holding company.

It is intimated that the Consolidated Gas Company common stock will be split on a two for one basis. At current prices this would bring the new stock to around $82 a share. Brooklyn Edison common is currently quoted around $262. Completion of the exchange would call for the issue of about 6,120,000 shares of Consolidated Gas common.

While substantial economies in various directions are anticipated from the merger, an official of Consolidated Gas Company informed the ELECTRICAL

WORLD that no definite action had yet been taken with regard to any possible reduction in rates. Other important details of joint operation yet remain to be worked out, while the financial set-up is being revamped along necessary lines.

A Quarter Billion Horse-Power Utilized

The total capacity of all the power-generating equipment installed in the various industries in the United States in 1923, from the highest type of steam turbine and internal-combustion engine down to the erratic windmill and the farm-work animal, was 230,514,000 hp., exclusive of the horsepower of pleasure automobiles. It is an astonishing fact, says the Department of the Interior, which agency compiled these figures, that the total horsepower capacity of the internal-combustion engines of pleasure automobiles is nearly twice as much as that used in all the industries, the total capacity for 1923 inclusive of pleasure automobiles being 684,044 hp. This tremendous capacity, if converted into man-power, would furnish about 60 able-bodied servants in constant attendance on every man, woman and child in the United States. The horsepower of industrial prime movers in 1923 was distributed as follows: Manufactures, 9 per cent; mines and quarries, 2 per cent; agriculture, 17 per cent; electric central stations and electric railroads, 11 per cent; steam railroads, 32 per cent; ships, 4 per cent; work animals not on farms, 1 per cent; automobiles not classed as pleasure cars, 23 per cent; miscellaneous, 1 per cent.

The population of the United States increased 45 per cent from 1899 to 1923, while the capacity of industrial-power equipment increased 260 per cent. In 1849, 66 per cent of the total industrial power equipment of the country was installed in farms; in 1923, only 17 per cent, the greater part being utilized by steam railroads, manufactures, central stations, electric railways and automobiles other than pleasure cars.

These figures are taken from a report entitled "Power Capacity and Production in the United States," just published by the Department of the Interior as Water-Supply Paper 579 of the Geological Survey. It contains information about the capacity of the different types of prime movers installed in the industries in the United States from 1849 to 1923 and shows their relative growth by index numbers and by diagrams. The report also contains the monthly figures of production of electricity and consumption of fuel by public-utility power plants from 1919 to 1926, estimates of the potential water-power resources of the United States, and reports of the developed water power for different years which have previously been published by the Geological Survey in mimeographed form.

The information contained in the report has been collected in part by the Geological Survey in connection with its activities in studying the water resources of the country and their best utilization, in part by the Bureau of the Census in its periodic statistical study of the country's activities, and in part by the Federal Power Commission in connection with the administration of the federal water-power act. Some of the data have therefore been previously published in scattered statistical form, and some have been made available in multigraphed or mimeographed

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday May 15	Low 1928	High 1928
ABITIBI PWR. & PAPER, com., new — no par	83	72	85
Ala. Pwr., $7 cum. pf.—no par	k115	114½	115½
Allis Chalmers Mfg.,6% com.,ex.div.	126	115½	129¾
Aluminum Co. of Amer., com.	197½	120	197½
Aluminum Co. of Amer., 6% pf.	k110	105½	110½
Amer & Foreign Pwr., 7% pf.— no par	109½	105½	109½
Amer. & Foreign Pwr., com.—no par	37½	22½	38½
Amer. Bosch Magneto, com.—no par	30½	15½	34½
Amer. Brown Boveri Elec.†,	20½	10½	20½
Amer. Brown Boveri Elec., pf. $7	64	40½	65
Amer. Gas & Elec., 6% pf.—no par	109½	106½	111
Amer. Gas & Elec., com. †—no par	177	117½	184
Amer. Lt. & Trac., 6% pf.	118	116	120
Amer. Lt. & Trac., new com.	284½	170	248½
Amer. Pwr. & Lt., 6% pf.	107½	104	109½
Amer. Pwr. & Lt., com. †—no par ex.div.	93½	62½	95
Amer. Pub. Serv., 7% pf.	a102	97½	102
Amer. Pub. Serv., com. †	k 70	70	75
Amer. Pub. Utilities, 7% ptc. pf.	a 96½	87½	97
Amer. Pub. Utilities, 7% pr. pf.	a102½	95½	102½
Amer. Pub. Utilities, com.	k 55	60	65
Amer. States Sec., A	a 13	4	13½
Amer. States Sec., B	a 16½	4½	17½
Amer. Superpwr., 6% 1st pf.	l 105	....	....
Amer.Super pwr., Class A†—no par	49½	36½	56
Amer.Super pwr., Class B†—no par	51½	37	56½
Amer. Wtr. Wks. & Elec., 6% pf.	105	101½	106
Amer. W.W. & E., com. new—no par ex.div.	66½	52½	70½
Anaconda Copper cap. $3	74½	53½	74½
Appalachian Electric Pwr., 7% pf.	109	108½	110
Arkansas Pwr., & Lt. 7% pf	107½	107½	111
Assoc. Gas & Elec., $3.50—50	54½	....	....
Assoc. Gas & Elec., pf.—$6—no par.	95	96	98½
Assoc. G. & E., Class A, 10—no par.	52½	47	52½
BABCOCK & WILCOX, 7% com.	124½	117½	127
Binghamton L., H. & P., $6 pf.	107½	102	109½
Birmingham Elec., pf.—$6—no par.	107	104	107
Blackstone Valley G. & E., 6% pf.	k108	106	112
Blackstone Valley Gas & Elec., 10% com.—50	k163	135	170
Blaw-Knox, com.†	d101	91	105
Brazilian Trac., Lt. & Pwr.,com.,new	f 64½	....	....
Broad River Pwr., 7% pf.	105½	105	108½
Brooklyn Edison, 8% com.	264½	206½	268½
Buffalo, Niagara & East. Pwr., $1.60 pf.—25	l 26½	....	....
Buffalo, Niagara & East. Pwr. com. $1.20—no par	l 43	....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	99	98	101
California Ry. & Pwr., 7% pf.	m135	....	....
Carolina Pwr. & Lt., pf.—$7—no par	l111½	109	111
Central & S. W. Util., $7 pf.—no par	a104½	99½	105½
Central & S. W. Util., pr. in. $7 pf.—no par	a112	103½	112
Central Ark. Ry. & Lt., 7% pf.	106½	105	107½
Central Ill. Pub. Serv., $6 pf.	a 99½	97½	100½
Central Ind. Pwr., 7% pf.	a101	95	101
Central Maine Power, 6% pf.	97	96	98½
Central Maine Power, 7%	110	109	112
Central Pwr. & Lt., 7% pf.	110½	104½	110
Central States Elec., 7% pf.	120½	104½	121½
Cincinnati Gas & Elec., 5% com.	g100½	97½	100½
Cities Service, $6 pf.—no par	l 103½	94½	103½
Cities Service, pf. B—no par	l 9½	8½	9½
Cities Service, pf. BB—no par	l 97	88½	97
Cities Service, com.—20	l 70½	54	70
Cities Service, Bks. Shrs.—10	l 34½	26½	34½
Cities Service Pwr. & Lt., 7% pf.	k108	106	109½
Cities Service Pwr. & Lt., 6% pf.	k101	95	100½
Cleveland Elec. Illg., 6% pf.	114	113	115½
Cleveland Elec. Illg., 10% com.	420	350	425
Columbia Gas & Elec., 6% pf.	109½	107½	110½
Columbia G. & E. com. $5—no par	118	89½	118
Columbus Elec. & Pwr., $2 com.—no par.	k 79½	66	79½
Columbus Elec. & Pwr., 7%	113	....	....
Columbus Ry., Pwr. & Lt., 7%	109½	....	....
Columbus Ry., Pwr. & Lt., 7% pf. B	109½	....	....
Columbus Ry., P. & Lt. com. no par	125	120	125
Commonwealth Edison, 8% com.	a187	165	189
Commonwealth Pwr., 6% pf.	103½	102½	104½
Commonw'th Pwr., $2, com.—no par	87½	62½	87½
Conn. Lt. & Pwr., 8% pf.	121	120	123
Conn. Lt. & Pwr., 7% pf.	117½	118	121
Cons. Gas of N. Y., pf.	103½	101½	105
Cons. Gas of N. Y., com. $5—no par. ex.div.	166	119½	170½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	e111	110	113
Cons. Gas, Elec. Lt. & Pwr. of Balti., 5% pf.	e105½	100½	105½
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $3.00—no par	e 88	67½	93
Consolidated Pwr. & Lt., 7% pf.	105	....	....
Consumers Pwr., 6% pf.	104½	106	107
Consumers Pwr., 6.6% pf.	105	106	107
Continental Gas & Elec., 7% pr. pf.	108½	106½	108½
Conti. G. & E. com. $4.40—no par.	k240	240	265
Crocker Wheeler, com.†	47	....	....
Crocker Wheeler, 7% pf.	95	....	....
DALLAS PWR. & LT., 7% pf.	110	110	111½
Dayton Pwr. & Lt., 6% pf.	109½	108½	110½
Derby Gas & Elec., 7% pf.	102	96	100½
Detroit Edison, 8% com.	k192	166½	194½
Dubilier Condenser, com.—no par.	5½	2½	5½
Duke Pwr., cap.	k138	130	145
Duquesne Lt., 5% pf.	105½	104½	105½
EASTERN NEW YORK UTIL., $7 pf.	k110½	111	112½
Eastern States Pwr. B	k 26½	11½	26½
Eastern States Pwr., pf.	k100	98	100½
East. Tex. Elec., 7% pf.	108	106	109
Edison Elec.of Boston, $12 com.	d301	252	301
El Paso Elec. 7% pf.	113	110	112½
Elec. Bond & Share, 6% pf.	l109½	108½	111½
Elec. Bd. & Sh. Sec., com. $1—no par ex. rights	l120	76	127½
Electric Household Util.†	a 23½	13½	25
Elec. Investors, 6% pf.—no par.	104	101	104½
Elec. Investors, com.†—no par.	79½	40½	79½
Elec. Pwr. & Lt., ctfs. pf.	109½	106½	110½
Elec. Pwr. & Lt., ctfs., 40% pd.	m127	120½	129½
Elec. Pwr. & Lt., ctfs., com.—no par	45½	28½	45½
Elec. Ry. Securities, com.—no par.	6½	....	....
Elec. St. Battery com. $5.25—no par	84½	69	84½
Elmira Wtr., Lt. & R.R., 7% pf.	105	104	107
Empire Pwr., ptc.†	39	27½	39½
Engr. Pub. Serv. $7. pf.—no par	110½	107	110½
Engr. Pub. Serv., com.—no par.	45	33	46½
Eureka Vacuum Cleaner, com. $4—no par.	75½	69	79
FAIRBANKS MORSE, 7% pf.	112	104	114½
F.-M., com.—$3—no par.	44½	32½	54
Federal Lt. & Trac.,com $1.40.	54½	42	56½
Federal Lt. & Trac., $6 pf.—no par ex.div.	107½	98	109
Florida Pwr. & Lt., 7% pf.	k107½	105	108
Ft. Worth Pwr. & Lt., 7% pf.	l114½	113	114½
GALVESTON-HOUSTON ELEC. 6% pf.	82	75	85
Galveston-Houston Elec., com.	42½	31½	42½
General Cable, Cl.A	78	56	84½
Gen. Elec. $3 com.—no par.	160	124	174½
Gen. Elec., special—6%	11½	11½	11½
Gen. Gas & Elec. (Del.) com A $1.50—no par.	47	35½	48½
Gen. G. & E. (Del.) pf. A $8—no par	135	125	144
Gen. G. & E. (Del.) pf. A $7—no par.	118	110	120
Gen. G. & E. (Del.) pf. B $7.	114½	105½	114½
Gen. Pub. Serv., $7 pf.	140	115	140
Gen. Pub. Serv., com., no par.	28	16½	29
General Public Utilities, $7 pf.	k102½	98	101
Ga. Lt., Pwr. & Rys., com.	k 58	55	55
Gt. Western Pwr., 7% pf.	k105	....	....
IDAHO PWR., 7% pf.	110	109	111½
Ill. No. Utilities, 6% pf.	k 99	96	100
Ill. Pwr. & Lt., 7% pf.	k105½	103	107
Indianapolis Pwr. & Lt., 6% pf.	105½	102	107½
Indianapolis Pwr. & Lt., $7 pf.	102	100	105
Ingersoll Rand com.	97	90	98
Int. Combus. Engr., com. $2—no par ex.div.	65½	45½	65½
Int. Combustion Engr.,7% pf.	k104½	103	106
Int. Util., Class A—$3.50—no par.	49½	44½	52
Int. Utilities, Class B—no par.	13½	6½	16½
Interstate Pwr., pf.—$7—no par.	103½	99	103½
Interstate Pub. Serv., 7% pf.	106	103	106½
Iowa Ry. & Lt., 7% pf.	101	102	103
JERSEY CENTRAL PWR. & LT. CO., 7% pf.	106½	105	107
Johns-Manville. com.†—no par.	130½	111½	134
Johns-Manville, 7% pf.	m122½	119½	121½

Stock Exchange: eChicago; kSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid price Saturday, May 12. lBid price Wednesday, May 16. mLatest quotations available. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday May 15	Low 1928	High 1928
KANSAS CITY POWER & LIGHT pf. $7	k112¼	111¼	114
Kansas Gas & Elec. 7% pf.	f110¼	107	110
Kelvinator Corp.	19¼	11¼	22¼
Kentucky Hydro-Elec., 7% pf.	k104	100	105
Kentucky Sec., 6% pf.	95	94	98
Kentucky Sec., 5% com.	150	140	150
Kentucky Utilities, 6% pf.	105	100	105
LACLEDE GAS LT., 10% com.	232	200	260
Lehigh Pwr. Sec., com.—no par	37	19¼	40
Long Island Ltg., 7% pf.	k110¼	110¼	112½
Long Island Ltg., 6% pf.	k109	107	109
Long Island Ltg., com.†—no par	k210¼	170	225
Los Angeles Gas & Elec., 6% pf.	h112	105½	112½
Louisville Gas & Elec., cl. A. $1.75	38¼	28	38¼
MAN. ELEC. SUPPLY, cap. $5—no par	55½	50	61
Maytag Co., com. 50—no par	38¼	30	40½
Memphis P. & L., pf.—$7—no par	110	109	111
Metropolitan Ed., pf.—$6—no par	100	103	109¼
Metropolitan Ed., pf.—$7—no par	109¼	109	111
Metropolitan Ed., com. $8—no par	k170	125	185
Middle West Utilities, 6% pf.	a100½	93¼	100½
Middle West Util., 6% pr. lien	a107	99	108
Middle West Util., com. $7—no par	a160	123½	169
Midland Utilities, pr. in. 6% pf.	a 95½	94¼	97
Midland Utilities, 6% pf. A	a 90¼	89½	92½
Milwaukee Elec. Ry. & Lt., 7% pf.	105	100	106
Milwaukee Elec. Ry. & Lt., 6% pf.	100	98	110
Minn. Pwr. & Lt., 7% pf.	f108¼	107	109
Miss. River Pwr., 6% pf.	k112	94	112½
Miss. River Pwr., 3% com.	171	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par	109¼	107½	110
Mohawk Hudson Pwr., 2d pf.—$7—no par	k105	100	109
Mohawk Hudson Pwr., com.—no par	50¼	29¼	53
Montana Pwr., 5% com.	171	102½	175
Montreal Pwr., 7% com.	f 114¼	....	....
Mountain States Pwr., 7% pf.	k104	97	105
Mountain States Pwr., com.†	18	....	....
NASSAU & SUFFOLK LTG., 7% pf.	110½	98	110½
National Carbon, 8% pf.	m136½	136½	139½
National Elec. Pwr., A†	a 40	27¼	42
National Lt., Ht. & Pwr., com.	m 24	20	30
National, Light, Ht. & Pwr., 5% pf.	m 72	70	80
National Pwr. & Lt., pf.—7%	110	108½	111
National Pwr. & Lt., com.†—no par. ex div.	35½	21¾	35½
National Pub. Serv., 7% pf.	102¼	99	103
National Pub. Serv., 7% pfc., pf.	114	....	....
National Pub. Serv., A com. $1.60—no par	29¼	22	29¼
National Pub. Serv., B com.—no par	33¾	24½	34½
Nebraska Pwr., 7% pf.	f110½	110	111½
Nevada-Calif. Elec., com.	m 33	22	37
New Brunswick Pwr., 4% pf.	64	60	70
New Eng. Pub. Serv., pr. in. pf. $7	110	98½	110½
New Eng. Pub. Serv., pf. $7	98	95	108
New Orleans Pub. Serv.—7% pf.	108	106	110
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	102	91	100
N. Y. Central Elec., 7% pf.	105	101	105½
New York Power & Light 7% pf.	114¼	....	....
Niagara Falls Pwr., 7% pf.—25	28¼	27½	28¼
No. Amer., 6% pf.—50	55	53½	55½
No. Amer., com.—10	77½	58¼	78½
No. Amer. Edison, $6 pf.—no par ex div	103¾	102½	105½
Northeastern Pwr., com.	30½	19¼	31
No. N. Y. Utilities, 7% pf.	109	103	109
No. Ohio Pwr., com.—no par	31¼	18	32
Northern Ohio Pwr. & Lt., 6% pf.	100	90	99
No. Ont. Lt. & Pr. 6% pf.	k 99¼	94	100
No. Ont. Lt. & Pwr., 4% com.	m 72	73	78
No. States Pwr. (Del.), 7% pf.	109	108½	110½
No. States Pwr. (Del.), 8% com.	148½	123	152
No. Texas Elec., 6% pf.	55	45	70
No. Texas Elec., com.	19	....	....
OHIO BRASS, com. B $4—no par.	94½	89	100½
Ohio Brass, 6% pf.	k105	106	111
Ohio Pwr., 6% pf.	108	104	109½
Ohio Pub. Serv., $6 pf.	108	95	105
Ohio Pub. Serv., 7% pf.	112½	107	112
Ohio River Edison, 7% pf.	109½	106	109½
Oklahoma Gas & Elec., 7% pf.	114½	106	115½
PACIFIC Gas & ELEC., 6% pf.	29	26½	30
Pacific Gas & Elec., 8% new com.	f 53¼	43½	53½
Pacific Pwr. & Lt., 7% pf.	f110½	106	110
Penn Cent. Lt. & Pwr., $5 pf.—no par	c 81	79¾	82
Penn-Ohio Edison, 6% pf. no par	99½	93¾	100
Penn-Ohio Edison, 7% pf.	108	97½	109
Penn-Ohio Pwr. & Lt., 7% pf.	111	....	....
Penn Pwr. & Lt.—$7—no par	f110½	109½	110½
Penn Wtr. & Pwr., $2.50 com., new	c 89	68	90
Phila. Co., 5% pf.—50	k 48	45½	48½
Phila. Co., 6% pf.—50	55	52	57
Phila. Co., com.—50	174½	145	174½
Phila. Elec., 8% com.—25	c 74½	55½	74½
Portland Elec. Pwr., 7% pf.	104½	100	104½
Portland Elec. Pwr., 6% pf.	95	78	96
Portland Elec. Pwr., 6% 2d pf.	83	55	88
Portland Elec. Pwr., com.	46	42½	52
Potomac Elec. Power, 6% pf.	f113½	....	....
Pwr. Sec., pf.—no par	60	50	68
Pwr. Sec., com.—no par	13½	11	14½
Public Serv. of Colorado, 7% pf.,	105	....	....
Pub. Serv. of N. J., 6% pf.	114½	103½	115
Pub. Serv. of N. J., 7% pf.	128½	118	129½
Pub. Serv. of N. J., $2 com.—no par	63¾	41½	66½
Pub. Serv. of No. Ill., 6% pf.	a110	110	115
P. S. of No. Ill., com. $8—no par	a185	159½	185
Pub. Serv. of No. Ill. $8 com.	a185½	159½	185½
Pub. Serv. of Okla., 7% pr. ln.	109	100	107
Pub. Serv. Elec. & Gas, 6% pf.	110	108	110½
Puget Sound Pwr. & Lt., 7% pf.	k110	105	109
Puget Sound Pwr. & Lt., $6 pf.—no par	102½	92	105½
Puget Sound Pwr. & Lt., com.	77½	34½	84½
RADIO CORP. OF AMER., $3.50 pf.—50	58½	54½	58½
Radio Corp. of Amer., com.—no par.	206½	85½	211
Rochester Gas & Elec. 6% pf. D.	105½	105½	106½
Rochester Gas & Elec., 7% pf. B.	107½	105	107
Rochester Gas & Elec., 6% pf. C.	105½	105½	106½
SAN JOAQUIN Lt. & Pwr., 7% pr. pf.	117	110	117½
St. Joseph Ry., L., H. & P., 5% pf.	k 75	70	75
Servel, Inc.	15½	4½	17½
Sierra Pacific Elec., 2% com.	k 40½	29	40½
Sioux City Gas & Elec., 7% pf.	106½	100	108½
Southeastern Pwr. & Lt., pf.—$7 no par	k 109	....	....
Southeastern Pwr. & Lt., pfc. pf.	k 89½	....	....
Southeastern Pwr. & Lt., com.—no par	60	40½	61
So. Calif. Edison, 8% pf.	49	38½	41
So. Calif. Edison, 7% pf.	29	27	29½
So. Calif. Edison, 6% pf.	27½	25¾	27½
So. Calif. Edison, 8% com.	53	43¾	53½
Southern Cities Utilities, 7% pf.	92	75	92
Southwestern Lt. & Pwr., A $3.	80	60	80
Southwestern Lt. & Pwr., B.	65	60	65
Southwestern Lt. & Pwr., $6 pf.	95	88	96½
Southwestern Pwr. & Lt., 7% pf.	k113½	103	115
Standard Gas & Elec., 8% pf.	70½	65	71½
Standard Gas & Elec., 7% pr. pf.	114½	110½	115
Standard G. & E., com. $3.50	73½	57½	74½
Standard Power & Light, com.	51½	29½	51½
Standard Pwr. & Lt., 7% pf.	k106½	98	106
Staten Island Edison, pf.—$6—no par	102½	99	103½
Superheater, $6 com.—no par	155	155	178
Syracuse Lighting, 7% pf.	110	103	112½
Syracuse Lighting, 8% pf.	k117½	114	119
TAMPA ELEC., com. $2	k 70	62	71
Tenn. Elec. Pwr., 6% pf.	103	92	103
Tenn. Elec. Pwr., 7% pf.	109½	107	110
Tex. Pwr. & Lt., 7% pf.	f114½	113½	115
Tide Water Pwr., 8% pf.	111	108	112
Timken Roller Bear., com.—$4 no par	129½	112½	134
Toledo Edison, 7% pf.	109½	108	111
Toledo Edison, 6% pf.	105	95	105
Toledo Edison, 6% com.	k145	120	150
Tri-City Ry. & Lt., 6% pf.	90	88	102
UNITED GAS & ELEC., 7% pf.	96½	98	103
United Gas & Elec. (N. J.), 5% pf.	75	70	77
United Gas Impr., 8% com.—50	c148½	114½	149½
United Lt. & Pwr., pf.—$4—no par	a 57½	53	58
United Lt. & Pwr., pf.—$6.50—no par	102½	94½	103½
United L. & P., com. A .48—no par.	k 25½	13½	26½
United L. & P., com. B .48—no par.	k 30	20	30
Utah Pwr. & Lt., 7% pf.	f112½	109¼	112
Utica Gas & Elec., 7% pf.	105½	105	106½
Utica Gas & Elec., 8% com.	k200	215	225
Utilities Pwr. & Lt., 7% pf.	101½	98	103
Utilities Pwr. & Lt., com. A $2.	41½	28½	41½
Utilities Pwr. & Lt., com. B $1—no par	30½	18½	30½
VERMONT HYDRO-ELEC., 7% pf.	99	95	102
Virginia Elec. & Pwr., 7% pf.	k110½	108	111
Virginia Public Service 7% pf.	102½	97	103½
WAGNER ELEC., 7% pf.	b105	96½	105
Wagner Elec., com.—no par	b110	37	110
Washington Ry. & Elec., 7% com.	f450	....	....
Washington Ry. & Elec., 5% pf.	f102½	....	....
Washington Wtr. Pwr., 8% com.	225	175	235
West Penn Elec., 7% pf.	113½	109½	115
West Penn Elec., Cl. A $7.	109½	106½	112
West Penn Pwr., 7% pf.	115½	114½	117
West Penn Pwr., 6% pf.	k110	108½	113
West Virginia Lt., Ht. & Pwr., 7% pf.	95	94	100
Western Pwr., 7% pf.	104	98	105
Western States Gas & Elec., 7% pf.	k104	100	106
Western States Gas & Elec., com.	m 38	....	....
Westinghouse Elec. & Mfg., 8% com.—50	107½	88¼	112
Weston Elec. Instrument, Cl. A $2—no par	32½	30½	34
Weston Elec. Instrument, com.—no par	17½	12½	18½
Wheeling Elec., 6% pf.	106	95	109
Worthington Pump, 7% pf. A.	57½	46½	58½
Worthington Pump, 6% B.	k 49	41	51
Worthington Pump, com.	36½	28	36½
YALE & TOWNE com. $5—25.	78	58½	84½

Stock Exchange: *c*Chicago; *b*St. Louis; *e*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, May 12. *l*Bid price Wednesday, May 16. *m*Latest quotations available. †Dividend rate variable.

preliminary reports, but some have never before been published. All these statistics are now brought together in such a form as to be available for further study and any other use that may be found to be desirable. They will serve as base data on which must rest any future study in this country of the problems of power utilization in relation to economics and government.

OUTPUT IN CANADA SHOWS INCREASE OVER LAST YEAR.—Output of power from central electric stations in Canada during the month of February was 1,273,982,000 kw.-hr., as compared with 1,317,882,000 in January and with 1,065,850,000 in February, 1927. This total includes both water and fuel developed power, the amount attributed to the former in February being 1,256,242,000 and to the latter 17,650,000 kw.-hr. Quebec stations continue to account for the majority of output, being credited with 603,303,000 kw.-hr., an increase of roughly 25 per cent over February of last year. Ontario was second with 462,441,000, followed by the Prairie provinces with 105,972,000 British Columbia, 87,882,000 and the Maritime provinces, 10,317,000. British Columbia reported a daily average of 3,028,000 kw.-hr. for February, as compared with 3,011,000 in January last and 2,610,000 in the same month of 1927. The total in the Maritime provinces equals that of March, 1927, which hitherto was the highest point ever reached by the Maritime stations. Exports of energy from Canada averaged about 4,300,000 kw.-hr. daily and have fluctuated but slightly in the past year or two. The amount is about 9 per cent of the total generated.

Buffalo, Niagara & Eastern Adds to Directorate

Three new directors were elected at the annual meeting of the Buffalo, Niagara & Eastern Power Corporation, held May 8 in Buffalo. Lewis G. Harriman, Walter W. Huntley, and Hans Schmidt were added to the directorate to fill vacancies. Lewis G. Harriman is president of the Manufacturers & Traders-Peoples Trust Company and president of the Buffalo Chamber of Commerce. He is also connected as a director and officer with a number of Niagara frontier business organizations. Walter W. Huntley is also a director of the Niagara

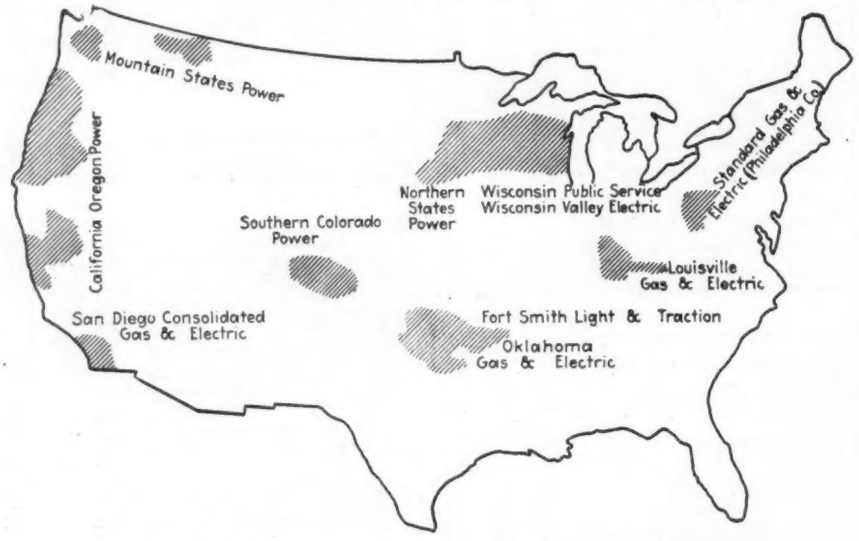
Electric Service Corporation. For a number of years he was connected with the Buffalo General Electric Company, but later entered the contracting field. Mr. Huntley is now president of the Elmwood Construction Company, Inc., of Buffalo. Hans Schmidt has long been prominent in business and financial circles on the Niagara frontier. Mr. Schmidt is a director of the Niagara Falls Power Company and president of Schoellkopf & Company.

Standard Gas & Electric Has Built Exceedingly Sound Structure

GRADUALLY extending its operations across the map of the United States, the Standard Gas & Electric Company has placed its imprint thereon at ten major points. One of the most romantic features of America's industrial progress during the past generation is the development of the power and light industry, the Standard Gas & Electric Company, with gross earnings from its system of slightly under $150,000,000 annually, has been no mean contributor toward this development.

In disbursements to shareholders this company has not been so liberal as have many other similarly situated holding companies. The average price of the parent company common stock in 1923 was $25. At a current price of about $72 its appreciation during the period has been exceedingly modest in comparison with that of other systems, such as American Power & Light, American Gas & Electric, American Water Works & Electric Company and others that could be mentioned, where stock splits have induced material enhancement in value. Standard Gas & Electric Company is among those which have intrenched themselves by turning back a large share of earnings into the system. Such a policy has built this group into one of the soundest utility systems in the country. Earnings last year on common stock amounted to $5.30 a share, against $4.68 the year before. This means that at a price of $70 the stock is worth about thirteen times earnings, which is considerably under the average for power and light holding companies. The property investment of the system is approximately $5.75 per dollar of gross revenue.

The financial year 1927 was a very profitable one for the Standard Gas & Electric System. Taking the holding company alone, the gross revenue amounted to $13,124,130, and of this $12,881,008 was net revenue. This is an increase of approximately 20 per cent both in gross and in net. For the system as a whole the gross earnings from the company's public utility properties amounted to $145,953,139, and net earnings were $63,145,163, which indicates an operating ratio of 56 per cent, against almost 58 per cent in 1926. There is a balance available for common stock equivalent to $6.60 a share on the average amount of common stock outstanding. The parent company pays a dividend of $3.50 on common stock.



Standard Gas System widely diversified geographically

The financial set-up of the Standard Gas & Electric Company is in an unusually strong position. Common stock totals 1,418,803 shares of no par value. The surplus shown in the most recent balance sheet is $12,166,135. There are three issues of preferred stock, one 6 per cent, one 7 per cent and one 8 per cent, aggregating $48,274,000 in book value. The funded debt also comprises three separate issues, all bearing 6 per cent and totaling $40,000,000 book value. The company again established a new record in 1927 in the sale of preferred stock to customers. The par value of sales totaled $31,975,600, which is 27 per cent higher than the 1926 total. Approximately 22,000 new shareholders were added during the year, a factor of importance in the company's public relations.

During the year many of the company's subsidiaries took advantage of the low money rate and a satisfactory market for power and light securities to accomplish refunding operations with resulting large savings in interest and dividend charges.

New Public Utility Financing Active

Eight new offerings were made by electric light and power companies during the week ended May 17, two in the form of debentures, five in the form of gold bonds and one in the form of gold notes. The American Commonwealths Power Corporation issued 5½ per cent gold debentures to the amount of $4,500,000 at 96½ and interest to yield over 5.75 per cent. The American Gas & Power Company made an offering of secured gold debentures at 95½ and accrued interest, to yield over 5.30 per cent, a piece of financing involving a total of $6,500,000.

Two new offerings were made by the Public Utilities Consolidated Corporation, the two issues totaling $5,500,000. One issue was in the form of ten-year 6 per cent secured convertible gold bonds priced at 98 and accrued interest and the other in the form of first mortgage twenty-year 5½ per cent gold bonds priced at 97 and accrued interest.

Twenty-five year 5½ per cent sinking fund secured gold bonds, series A, of the Islands Edison Company were issued to the amount of $2,250,000 at 96 and accrued interest, to yield 5.80 per cent.

First mortgage and refunding 5 per cent gold bonds of the Indiana Electric Corporation were offered to the amount of $3,268,000, the price being 100 and interest. The Electric Public Utilities Company made an offering of three-year 5 per cent gold notes at 97¼ and interest, amounting to $3,000,000.

The unexchanged portion of a new issue of $35,000,000 Associated Gas & Electric Company debenture bonds, amounting to $8,750,000, were offered at par and interest to yield 5 per cent.

RECENT LISTINGS. — The Baltimore Stock Exchange has authorized the listing of 5 per cent cumulative preferred stock, series A, of the Consolidated Gas, Electric Light & Power Company of Baltimore (par $100) to the amount of $15,500,000 and of 4½ per cent, series B, first refunding mortgage gold bonds of the Pennsylvania Water & Power Company to the amount of $6,000,000. The Boston Stock Exchange has authorized the listing of first mortgage sinking fund gold bonds, 6½ per cent series, due 1953, of the Electric Power Corporation (Elektrowerke Aktiengesellschaft) to the amount of $5,000,000 and additional 6 per cent convertible gold debentures of the Peoples Light & Power Corporation totaling $750,000.

Business News and Market Conditions

N.F.P.A. Accepts 1928 Code

Rules Virtually Same as Advance Publication Report of Electrical Committee—Recognition Given to Increased Use of Higher Voltages in Wiring Work

AT SIX well-attended sessions of a special meeting of the electrical committee of the National Fire Protection Association at Atlantic City, N. J., this month the 1928 National Electrical Code was approved subject to a letter ballot of its members. The electrical committee meeting was preceded by a three-hour meeting of the correlating committee which was appointed at the February, 1928, meeting of the electrical committee, the agenda for that meeting being too extensive for its complete disposal during the time available.

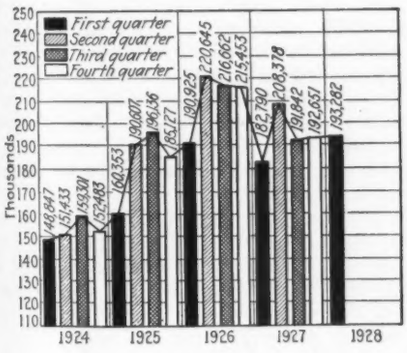
At the annual meeting of the N.F.P.A. held at Atlantic City on May 7, 8, 9 and 10 an enthusiastic reception was accorded the electrical committee's report. The report was approved by the N.F.P.A. subject to a letter ballot of the members of the electrical committee, after which it will be sent to the executive committee of the N.F.P.A. and later to the American Engineering Standards Committee. It is thus expected that the 1928 code will be available for distribution in the early fall.

Substantially all the rules as submitted by the correlating committee were adopted by the electrical committee and virtually all the articles were approved unanimously. Under the head of definitions the term "extra hazardous location" was omitted and the definition applying thereto was combined under the head "hazardous location." Article 5, wiring methods, as well as article 9, grounding, came in for a good deal of discussion. In article 6, conductors, a very helpful development has been added in the way of providing larger circuits in dwellings and encouraging more circuits to provide for the greater use of appliances. The rules for electrical metallic tubing, under article 5, remained virtually the same as published in the advance publication report of the electrical committee covering the proposed 1928 National Electrical Code.

In article 50, circuits and equipment operating at more than 600 volts between conductors, provision was made under rule 5009, service equipment, to permit the use of other than oil circuit breakers if such devices are developed and found suitable and will satisfy the interest of the code. The section devoted to automatic overload circuit breakers under this rule also was expanded. In general, article 50 was considerably expanded, both in number of items and treatment, to keep in step with the considerable increase of the use of higher voltages in wiring work.

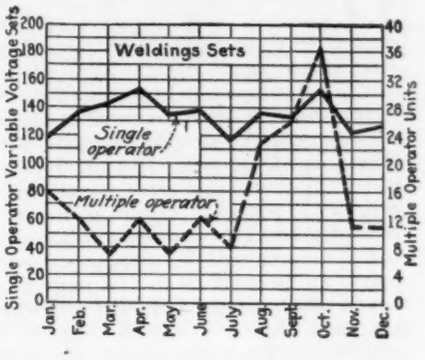
At the annual meeting of the N.F.P.A. A. M. Schoen, chief engineer of the Southeastern Underwriters' Association of Atlanta, Ga., was elected president.

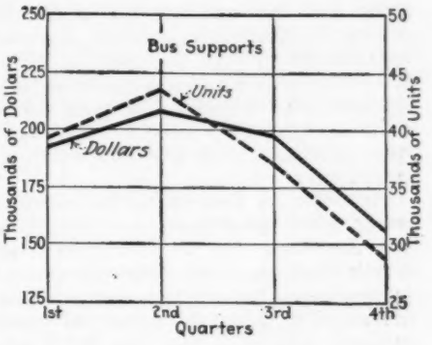
Sales of Electric Washing Machines by Quarters

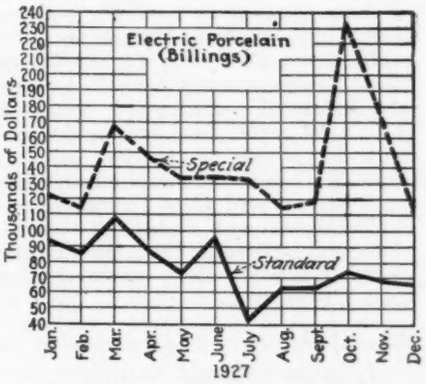


NOTE—March sales figures showed a substantial gain over those of February.

N.E.M.A. Statistics







Other data covering 1927 appeared in preceding issues.

Production of Steel—All Kinds (Tons per Year U. S.)

From American Iron & Steel Institute Statistical Department

Year	Ingots and Castings—by Processes: Open Hearth	Bessemer	Crucible	Electric	Miscellaneous	Total Production	Per Cent Electric	Alloy Steel—Included in Total Production Table: Open Hearth Bessemer and Crucible	Electric	Total Alloy	Per Cent Alloy by Electric Furnace
1909	14,493,936	9,330,783	107,355	13,762	9,185	23,955,021	0.0574	.....	.....	.....	.....
1910	16,504,509	9,412,772	122,303	52,141	3,194	26,094,919	0.2000	.....	.....	.....	.....
1911	15,598,650	7,947,854	97,653	29,105	2,844	23,676,106	0.0123	.....	.....	.....	.....
1912	20,780,723	10,327,901	121,517	18,309	2,853	31,251,303	0.0586	.....	.....	.....	.....
1913	21,599,931	9,545,706	121,226	30,180	3,831	31,300,874	0.0965	.....	.....	714,357	.....
1914	17,174,684	6,220,846	89,869	24,009	3,622	23,513,030	0.1020	637,249	9,344	646,593	1.442
1915	23,679,102	8,287,213	113,782	69,412	1,527	32,151,036	0.2160	993,203	27,944	1,021,147	2.735
1916	31,415,427	11,059,039	129,692	168,918	604	42,773,680	0.3941	1,291,486	71,129	1,362,615	5.220
1917	34,148,893	10,479,960	126,716	304,543	495	45,060,607	0.6750	1,513,757	130,578	1,644,335	7.940
1818	34,459,391	9,376,236	115,112	511,364	329	44,462,432	1.1500	1,496,891	290,961	1,787,852	16.300
1919	26,948,694	7,271,562	63,572	384,452	2,952	34,671,232	1.1100	1,299,556	181,632	1,481,188	12.250
1920	32,671,895	8,883,087	72,265	502,152	3,535	42,132,934	1.1920	1,414,720	245,572	1,660,292	14.780
1921	15,589,802	4,015,938	7,613	169,499	945	19,783,797	0.8570	746,302	63,246	809,548	7.810
1922	29,308,983	5,919,298	28,606	346,039	.....	35,602,926	0.9710	1,548,077	125,419	1,673,496	7.500
1923	35,899,657	8,484,088	44,079	515,872	.....	44,943,696	1.1490	1,911,513	194,976	2,106,489	9.270
1924	31,577,350	5,899,590	22,473	432,526	.....	37,931,939	1.1400	1,837,846	188,563	2,026,409	9.300
1925	38,034,488	6,723,962	19,562	615,512	.....	45,393,524	1.3610	2,139,193	293,780	2,432,973	12.080
1926	40,691,979	6,934,568	15,493	651,723	.....	48,293,763	1.3500	2,156,603	306,811	2,463,414	12.460
1927	38,068,335	6,191,727	9,036	666,087	.....	44,935,185	1.4823	1,922,922	343,517	2,266,439	15.156

Market Conditions

DISTINCT optimism as to the business outlook pervades the electrical field and current business is in good volume. In New England many small orders were placed. Motor sales amounted to about $50,000. Central-station companies are buying wiring material steadily in small lots. The demand for motors in the Eastern district is strong and some sizable bookings are expected to mature in the next 30 to 60 days. A manufacturer of gypsum products will soon make commitments for new plants to cost more than $1,000,000; a copper company will make purchases for a proposed refinery to cost $4,000,000, while another copper interest in Utah will electrify at a cost of over $1,000,000. A washing machine manufacturer placed an order for $20,000 worth of motors and a maker of talking machines ordered disk type motor units amounting to $30,000. Railroads have purchased over $300,000 worth of equipment.

An order for four 40,000-kw. vertical water wheel generators was placed in the Southeast for a development in North Carolina. An order for power transformers from the same state amounted to $50,000. Industrial plant business also is active. In St. Louis spotty business is reported. The volume of sales is good in the Middle West, and utility companies continue active with construction work. On the Pacific Coast power company business is good and industrial plant buying is active. New steel plants in Los Angeles and San Francisco, a lumber mill at Klamath Falls, an automobile body plant in Seattle, a seed plant and warehouse in San Bruno and a terminal for San Francisco produce and provision wholesalers are active projects involving more than $10,000,000.

Metal Market Active—Prices Higher—Lead Steady

Exceptionally active sales of copper with an advance in price took place in the non-ferrous metal markets. With the exception of lead which is steady prices have shown an advance. Copper producers have advanced their price from 14¼ cents to 14⅜ cents per lb. delivered Connecticut Valley basis. Effective May 15, Copper Exporters, Inc. advanced their copper price from 14.50 cents to 14.625 cents per lb. c.i.f. usual European destinations. Lead has been quiet with a few sales at price concessions below the prevailing market levels. Tin is easy with a good demand for spot metal.

NEW YORK METAL MARKET PRICES

	May 9, 1928 Cents per Pound	May. 16, 1928 Cents per Pound
Copper, electrolytic	14.025-14.05	14.15-14.175
Lead, Am. S. & R. price	6.10	6.10
Antimony	11¼	11¼
Nickel, ingot	35	35
Zinc spots	6.325	6.40
Tin, Straits	51.875	52¼
Aluminum, 99 per cent	24.30	24.30

Base copper wire price May 16, 1928, 16¼ cents.

Motor Demand Strong in Eastern District

The call for motors for industrial service is active in the Eastern district and transactions are reaching a higher level than in several weeks. Sizable bookings are expected to mature during the next 30 to 60 days. Motor units of a wide range in horsepower rating are enjoying a good market. A manufacturer of gypsum products will soon make commitments for three new plants to cost more than $1,000,000; a copper company will make purchases for a proposed $4,000,000 refinery, while another copper interest will electrify its surface properties in Utah and is placing orders for equipment of various character, including electric mine locomotives, to cost upward of $1,000,000. A manufacturer of washing machines in Northern New York has contracted for a quantity of ⅛-hp. motors, with a leading producer, totaling about $20,000. A maker of talking machines in New Jersey has placed an order for disc type motor units with the same manufacturer, at $30,000.

An order for motor and control equipment for a New York subway extension has been placed at a price of $175,000. A steam railroad in the same city has contracted for similar apparatus, for its electric system, totaling about $80,000. A Middle West steam line has purchased electric drive equipment for gasoline car service to an amount of about $35,000. Central-station business is a little spotty, with the bulk of orders centered in substation and affiliated equipment. A New Jersey utility has contracted for a quantity of feeder regulators, totaling $45,000. Another Eastern utility has placed an order for a sizable quota of bus supports and units of indoor type. A number of good contracts for similar apparatus are now pending. Instrument business is improving and inquiries are increasing both in volume and individual account.

Sales of electric appliances are lagging. Jobbers both in the New York and Philadelphia districts report business as unsatisfactory. Low prices and the tendency to cut below normal margins, coupled with keen competition, are making for a spotty situation which does not show signs of immediate betterment. Construction operations in the Eastern district includes the following:

The United Electric Light & Power Company, New York, will build a storage and distributing plant to cost $50,000. The Harlem Valley Electric Corporation has taken over the Carmel (N. Y.) Light & Power Company. The Purty Boat Works, Port Washington, N. Y., will erect a boatbuilding and repair plant to cost $150,000. The Nichols Copper Company, Laurel Hill, L. I., is arranging financing in amount of more than $4,000,000, for a new refining plant. The Atlantic City Electric Company is negotiating for the purchase of the municipal power plant at Beach Haven, N. J.

The Pennsylvania Railroad Company, Philadelphia, plans a cold storage plant to cost $1,000,000. The United States Gypsum Company, Chicago, plans a plant at Philadelphia to cost in excess of $300,000. Walker Brothers, Philadelphia, will build an electric equipment manufacturing plant at Spring Mill, Pa. to cost $80,000. County Commissioners, Pittsburgh, Pa., will receive bids until May 23, for ornamental cast iron light brackets. The Pusey & Jones Corporation, Wilmington, Del., will make additions in paper-making machinery plant to cost $350,000. The Annapolis & Chesapeake Bay Power Company has acquired the Herald Harbor Power Company and the Severna Electric Company, Anne Arundel County, Md. The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until May 29, for insulated wire and cable for Eastern and Western yards (Schedule 9060).

Large Generator Order Placed in Southeast

The largest power company order placed in the Southeast was for four 40,000-kw. vertical water-wheel generators for a hydro-electric development in North Carolina. Another order from the same state was for large power transformers amounting to $50,000. A Georgia company ordered copper wire amounting to $16,500 and distribution and small power transformers totaling $14,500. Some other central-station orders were for watthour meters amounting to $4,800 and creosoted pine poles costing in excess of $3,600. An order for large power transformers aggregating $200,000 is in immediate prospect and will undoubtedly be placed in a few days.

A Georgia municipality ordered a 5,000-kw. turbine and switchboard, and an oil company in Louisiana ordered a turbine of the same size. A cotton mill in Georgia ordered $3,000 worth of wiring materials and lighting fixtures for re-lighting its mill. Engineers are working on plans for a rayon plant in Virginia for which two 2,500-kw. turbogenerators and other equipment aggregating $100,000 will be required. Bids for the equipment in that plant will be asked in about three weeks. A 40,000-spindle cotton mill to be constructed in Alabama will require electrical materials amounting to $75,000. The building contract for that mill will be let within six weeks. Engineers also are working on plans for a tobacco by-product plant to be constructed in Kentucky. Construction projects are as follows:

The Alabama Mills Company, Birmingham, will build mills in different parts of the state to cost $3,000,000. The Gould Tire & Rubber Company, Tampa, Fla., plans a mill to cost $150,000. Greenville, Miss., plans a municipal power plant. The Hudson Silk Hosiery Company, Charlotte, N. C., plans a mill to cost $300,000. The Crisp County Power Commission, Cordele, Ga., will receive bids on July 10, for a hydro-electric power plant on the Flint River, to cost $1,000,000. The Tennessee

Eastern Electric Company, Johnson City, Tenn., has applied for permission to build a hydro-electric power plant on the Holston River, to cost $5,000,000. The Jarman Shoe Company, Nashville, Tenn., plans a plant to cost $150,000. The constructing Quartermaster, Fort Monroe, Va., will receive bids until May 28, for a lighting system at the Langley flying field, Va. The Bristol Gas & Electric Company, Bristol, Tenn., will make extensions in its transmission and distribution system to cost $500,000.

The Appalachian Electric Power Company, Charleston, W. Va., plans a substation near Williamson, W. Va., to cost $150,000. The Alabama Power Company, Birmingham, Ala., has acquired the power plant of Millport Gin, Ice & Power Company, Millport, Ala. The Southern Cities Power Company, Chattanooga, Tenn., plans a transmission line from Selma to Waynesboro, Tenn. The Virginia Electric & Power Company, will build a transmission line from Quantico to Occoquan, Va., to cost $150,000.

New England Places Small Orders in Good Volume

Small motor orders in the New England district were encouraging and amounted to about $50,000. A number of these orders included general purpose motors for power in reorganized shoe and leather working plants, and textile mills also ordered a number of loom motors. Control equipment business was steady, with one consisting of switchboard apparatus amounting to $5,000 being reported. Several small orders for sub-station equipment amounting to $8,000 also were recorded.

Central stations are buying steadily in small lots, and wire, pole line material and insulators are in good demand due to numerous short extensions of service lines. A number of arc welders recently were placed in eastern Massachusetts, and sales of welders so far this year are above those of last year. Electric furnaces are in demand though negotiations are slackening. Contractors power tools are in strong demand and orders are being considered for extensive equipment for a large state water supply contract. Equipment for twelve large electric service elevators has been ordered at a cost of about $25,000. Construction projects are as follows:

A 33,000-volt line, 11 miles long, will be built by the Public Service Company, New Hampshire, connecting Melvin Village with Center Ossipee. A transmission line approximately 33 miles long is planned between the Bristol Falls plant and Bristol by the Utilities Power Company, New Hampshire. The Blackstone Valley Gas & Electric Company, Pawtucket, R. I., plans an addition to its power plant, to cost $120,000.

Spotty Business Reported in St. Louis District

Business in the St. Louis district has been decidedly spotty. An order for wiring equipment in a federal building amounted to $6,000. Two fair-sized electric signs were sold at a cost of $2,000 each. Sales of stock apparatus has been below normal. Construction projects are as follows:

The Cowden Manufacturing Company, Kansas City, Mo., will build a garment factory to cost $130,000. The Chevrolet Motor Company, Detroit, plans an assembling plant near Leeds, Mo., to cost $1,000,000. The Union Electric Light & Power Company, St. Louis, plans a substation to cost $200,000. The Phillips Petroleum Company, Bartlesville, Okla., will make additions in its gasoline refining plants in Panhandle district of Texas, to cost $350,000. The American Potash Company, Dallas, Tex., plans a plant near Odessa, Tex., to cost $200,000. The Oklahoma Portland Cement Company, Oklahoma City, Okla., is planning a cement mill near Saratoga, Ark., to cost $500,000.

Olathe, Kan., is planning a municipal power plant. The Pumicite Company, St. Louis, plans plants at Stanley, Meade, Wilmore and Fowler, Kan., to cost $125,000. Boonville, Mo., will soon take bids for an addition to its municipal power plant. Campbell, Mo., will receive bids until June 5, for a municipal power plant to cost $40,000. The Arkansas Power & Light Company, Little Rock, Ark., has acquired the Southern Edison Company, Searcy, Ark. The Oklahoma Gas & Electric Company, Oklahoma City, Okla., plans a transmission line to Elmore City, Okla. The Central Power & Light Company, San Antonio, Tex., has acquired the Nixon Electric Light & Power Company, Nixon, Tex. Baton Rouge, La., will receive bids on May 29, for an ornamental lighting system. Fort Worth, Tex., plans an ornamental lighting system.

Volume of Business Good in Middle West

Industrial activity in the Middle West is somewhat sluggish although the volume of business transacted is quite substantial. General movement of commodities, as indicated by carloadings, is less, but lack of movement of coal largely accounted for this condition. The various utility companies are busy with a good deal of construction work. Among the interesting orders placed were included two live steam reheaters, one feed water heater, one low pressure and one intermediate pressure closed feed water heaters, one portable oil purifier, 7,000 5-amp. watthour meters, 275 direct current watthour meters, 5 to 600 amp. capacity, a quantity of current transformers and Mazda lamps valued at $250,000. Jobbers' sales are increasing slightly. Construction projects are as follows:

The General Tire & Rubber Company, Akron, Ohio, will build a factory and distributing plant at Chicago, to cost $250,000. Evanston, Ill., plans a municipal power plant, to cost $65,000. The Bliss & Laughlin Company, Harvey, Ill., plans an addition to its shafting factory to cost $100,000. The Morgan Dyeing & Bleaching Company, Rochelle, Ill., will build an addition to cost $75,000. The Thieme Brothers Company, Fort Wayne, Ind., plans an addition to its knitting mill, to cost $115,000. The Southeastern Indiana Power Company, Indianapolis, Ind., is arranging for the purchase of the Eastern Light & Power Company, the Suburban Light & Power Company and the Evans Electric Company in Marion, Johnson, Fayette and other counties. The Chrysler Corporation, Highland Park, Mich., will build additions to its automobile plant, to cost $300,000, including a power plant, to cost $80,000. E. I. du Pont de Nemours & Company, Wilmington, Del., plans an ammonia plant at Barksdale, Wis., to cost $400,000. Superior, Wis., plans an airport lighting system. The Wisconsin-Michigan Power Company, Appleton, Wis., will build a transmission line from Iron River to Phelps, Mich. The Interstate Power Company, Oelwein, Iowa, will make extensions in transmission lines at Westbrook, Minn. The Montana-Dakota Power Company, Minneapolis, Minn., plans extensions in transmission lines at Tappen, N. D. Cedar Rapids, Iowa, plans a call for new bids for an ornamental lighting system following the rejection of bids recently received. St. Paul, Minn., and Lincoln, Neb., plan an ornamental lighting system.

Industrial Business Active on Pacific Coast

Power company business has included orders for two carloads of steel guy strand, four carloads of poles and $2,500 worth of special steel pins. The Pacific Gas & Electric Company intends to spend $12,000 for rebuilding portions of its San Rafael to Petaluma transmission line. The United States Reclamation Service is requesting bids for a 19-mile, 66,000-volt, single power line and a 13-mile telephone line in the Nyssa (Ore.) district. Industrial business both actual and projected is excellent.

New factories projected include steel plants in Los Angeles and San Francisco for the Bethlehem Steel Corporation, a lumber mill and plant for Klamath Falls, a $2,500,000 plant in Seattle for the Fisher Body Corporation, a complete seed plant and warehouse in San Bruno and a $3,000,000 Marina district terminal for San Francisco produce and provision wholesalers. Street lighting business is very good.

The Seattle City Council has passed ordinances covering about $500,000 worth of work on its distribution lines. Ellensburg, Wash., has authorized an expenditure of $35,000 for improvements to its municipal plant. The port of Seattle plans a grain elevator to cost $1,500,000. Sales reported by jobbers include about $5,000 worth of transformers to local central-station companies, approximately 100 motors from 60 hp. down to industrial plants and $3,000 worth of pulleys for lumber mill drive. Construction projects are as follows:

Yuma, Ariz., is arranging to acquire the electric, gas and water utilities for $300,000, and will make extensions to cost $250,000. The Pacific Gas & Electric Company, San Francisco, has applied for permission to construct a hydro-electric power plant on Mokelumne River, near Jackson. A. M. Castle & Company, 1132 Blackhawk Street, Chicago, will build an iron and steel works at Los Angeles, to cost $350,000. The Montana Gypsum Products Company, Lima, Mont., plans a mill to cost $100,000.

The Royal Crystal Salt Company, Salt Lake City, Utah, plans a plant to cost about $500,000. The Centralia Lumber & Manufacturing Company, Centralia, Wash., plans a mill to cost $100,000. The Richfield Oil Company, Seattle, Wash., plans a plant to cost $200,000. San Jose, Torrance, Salinas, Culver City, Modesto and Santa Paula, Calif., plan ornamental lighting systems.

Activities of the Trade

Westinghouse Gets Order for Large Heating Equipment

Orders recently have been received by the Mansfield works of the Westinghouse Electric & Manufacturing Company for what is believed will be the largest installation of core baking ovens. The equipment goes to the New Zealand Government Railways, having been placed through Turnbull & Jones, Ltd., of Wellington, New Zealand, and the Westinghouse International Company. The complete installation will consist of a solid bank of baking compartments, ten in all, varying in width from 7 to 16 ft. The total width is 115 ft. Each compartment is 19 ft. long by 7½ ft. high.

Electricity will be used for heating the ovens, the heaters having an installed capacity of 1,185 kw. distributed through 192 5-kw. and 90 2½-kw. units. The order includes ovens, heaters, indicating and recording control panels and instruments for automatically controlling the temperatures in the compartments, motor blowers, transformers, ammeters and watt-hour meters. Bristol controlling instruments and American Blower Company motor blowers will be used.

THE A. J. LINDEMAN & HOVERSON COMPANY, Milwaukee, manufacturer of electric cooking and heating appliances, announces the new "L & H" electric storage type water heaters which are automatically controlled by a mercury switch contactor actuated by a helical thermostat.

THE CELORON COMPANY, division of the Diamond State Fibre Company, Bridgeport, Pa., in conjunction with the opening of its new laboratory, and the introduction to the electrical, radio and automotive fields of Celoron molding compounds, announces the appointment of R. W. Wales as factory representative on molding powders and resins.

THE UNION METAL MANUFACTURING COMPANY, Canton, Ohio, has received a contract from Seattle, Wash., for 538 twin-light standards 23 ft. high. The standards are of special design and construction and will embody the new type of fluted steel pole which was recently announced by the company.

THE EUREKA VACUUM CLEANER COMPANY, INC., Cleveland, has issued a 36-page folder embodying a sales plan for the "Premier" dealer. The plan covers a complete description of the new line of advertising and dealer sales helps for 1928.

THE CHISHOLM-MOORE MANUFACTURING COMPANY, Cleveland, manufacturer of chain hoists and trolleys, traveling cranes and electric hoists, announces that the Columbus McKinnon Chain Company, Tonawanda, N. Y., has acquired control of its hoist division. The general sales offices and factory will continue to operate at Cleveland, under the same name as in the past. S. H. Moore, who has been with the company for the past 30 years, will continue with the organization and the personnel as a whole will remain the same.

THE FOXBORO COMPANY, INC., Foxboro, Mass., manufacturer of indicating, recording and controlling instruments, has established a branch office at 2104 Magnolia Building, Dallas, Tex., with J. B. McMahon as district manager. He will have as his associates R. L. Mallory and C. L. Bryan. The Dallas territory includes the states of Texas and Louisiana and the southern sections of New Mexico and Arkansas.

THE GENERAL ELECTRIC COMPANY announces price reductions on its popular types of "Mazda" flashlight, radio panel, toy train, mine and hand lantern lamps. These reductions, the company states, have been made possible through improvements in manufacturing processes and will mean a saving to the consumer of about 20 per cent in his future purchases. Since 1924 prices on miniature "Mazda" lamps, including lamps for automobiles, have been reduced approximately 50 per cent. During the same period motor vehicles have been reduced in price about 12 per cent, while all commodities have increased 62 per cent in price.

THE W. N. MATTHEWS CORPORATION, St. Louis, manufacturer of electrical specialties and mechanical painting equipment, announces the removal of its Chicago office to 9 South Clinton Street, Madison Terminal Building, Room 720, on May 1. H. L. Brueck is district manager. The company also announces that E. B. Josler, formerly with the Central States General Electric Supply Company, has recently joined its Chicago organization.

THE NATIONAL FLUE CLEANER COMPANY, Groveville, N. J., manufacturer of soot blowers for fire tube boilers, announces the appointment of the following representatives: Walter G. Heacock Company, 30 Euclid Arcade, Cleveland, and 413 Penobscot Building, Detroit; the Jack Deerwester Company, 1621 University Avenue, St. Paul, Minn.; Charles Zinram, P. O. Box 487, Erie, Pa., and the Laib Company, Louisville, Ky.

THE TRUSCON STEEL COMPANY, Youngstown, Ohio, announces that it has purchased the Hydraulic Pressed Steel Company, Cleveland, which will be operated as its pressed steel division. The company states that the entire plant is being completely modernized and with the increase in facilities it will have one of the largest capacities for furnishing pressed and deep drawn steel of every description.

Williams Oil-O-Matic Adds Refrigerator to Line

An electric refrigerator known as the Williams "Ice-O-Matic" has been placed on the market by the Williams Oil-O-Matic Heating Corporation, Bloomington, Ill. The "Ice-O-Matic" is furnished in boxes of from 5 cu.ft. to 20 cu.ft. food storage capacity and retails at $200 to $260 for the machine and $310 to $515 for the box and unit. Five different cabinet models are available. The refrigerating unit uses methyl chloride.

The same two-cylinder heavy-duty compressor is used on all jobs, the cooling unit or evaporator varying with each size. The units will be sold under the same terms as "Oil-O-Matics" are sold to the dealers and the distribution will be offered first to regular "Oil-O-Matic" dealers. During April the company conducted a special sales drive to introduce the unit. On June 25 and 26 the company will hold its fourth international convention.

THE IDEAL COMMUTATOR DRESSER COMPANY, Sycamore, Ill., announces the appointment of the Superior Supply Company, Bluefield, W. Va., as its sales representative for the sale of Ideal commutator resurfacers and other maintenance equipment in the Bluefield territory.

LANDERS, FRARY & CLARK, New Britain, Conn., manufacturer of electrical appliances, announce that they have withdrawn from sale the electric heating devices branded "Thermax" and "Reliance." The company is now offering in their place the new "Universal" popular priced electric appliances and at the same time is retaining the higher priced "Universal" appliances.

THE BENJAMIN ELECTRIC MANUFACTURING COMPANY, 128 South Sangamon Street, Chicago, has placed on the market a new dust-tight glass cover developed to meet the demand for a lightweight, economical device that will guarantee the original efficiency of lamps and reflecting surfaces, and a new hand portable inspection light designed especially for very close inspection work.

THE ROBBINS & MYERS COMPANY, Springfield, Ohio (W. J. Myers, receiver), manufacturer of electric motors, generators and fans, announces that its New York office and warehouse are now combined and are located at 200 Varick Street.

HATHEWAY & COMPANY, INC., 16 Hudson Street, New York City, announces the removal to larger quarters at 225 Varick Street. The company is a national distributor for the Rattan Manufacturing Company, the Clifton Conduit Company, the A. E. Rittenhouse Company, the Clifduct Company, and the Superduct Company as well as local distributor for the Wirt Company, the Royal Electric Company and the Heinemann Electric Company. The Hatheway-Paterson Company, associ-

ated with Hatheway & Company, Inc., and representing the Gulf Cross Arms Company and the Bell Lumber Company, has also moved to 225 Varick Street, New York City.

THE TRUMBULL-VANDERPOEL ELECTRIC MANUFACTURING COMPANY, Bantam, Conn., manufacturer of "T V" safety switches, etc., announces that Ralph Mason has been elected vice-president in charge of sales. Mr. Mason has been identified with the company since 1913.

THE ROLLWAY BEARING COMPANY, INC., Syracuse, N. Y., announces the appointment of Alfred E. Munch, Jr., as its representative in the Chicago-Milwaukee district, with headquarters at 544 Railway Exchange Building, Chicago.

COPELAND PRODUCTS, INC., Detroit, manufacturer of electric refrigerators, announces that April shipments showed an increase of 41 per cent over the best previous month in the company's history.

New Equipment Available

Transposition Conduit

The "Natco" transposition conduit, to assist in meeting certain underground construction problems, has been placed on the market by the National Fire Proofing Company, Pittsburgh, manufacturer of "Natco" underground clay conduit. This new shape of conduit provides a means of transposing the position of ducts and cables in six-way, three-way or two-way multiple duct lines a quarter turn or 90 deg., or from an edge to a flat position or vice versa, in a distance of only six lineal feet. It also provides a means of transposing such duct lines and cables a half turn or 180 deg., or from a top to a bottom position or vice versa, in a distance of only twelve lineal feet.

It is supplied in six-way, three-way and two-way multiples in 24-in. lengths and each piece has a 30-deg. twist. "Natco" transposition conduit is used in building approaches to manholes or to central offices, where it is desired to change the position of cables in already existing duct lines, before entering such structures, thus avoiding the bending and crossing of cables therein. It also provides a means of changing the over-all height of conduit lines to avoid underground street obstructions or for bridge crossings.

Portable Oil-Testing Set

A portable set for testing the dielectric strength of transformer and circuit-breaker oil has been placed on the market by the Westinghouse Electric & Manufacturing Company. The set is light and compact and may be easily carried by one man. The case is of cast aluminum with a hinged cover so arranged that it may be removed entirely if desired. When the cover is thrown back the complete control equipment is easily accessible and the set is ready for service.

The set consists of a small testing transformer inclosed in a cast aluminum case and covered at the top by a "Micarta" panel which carries the voltmeter and the control equipment. Two high-voltage bushings are brought through the panel and form the support for the oil testing cup. The voltmeter, mounted flush with the panel and calibrated in kilovolts, indicates the breakdown value of the oil. The transformer used is designed so as to eliminate surges in the high-voltage winding and the method of control used for obtaining variable voltages does not cause any distortion in the wave form. As a special safety feature, a push button is furnished, mounted in a depression in the panel, with the control so arranged that this button must be held down during tests in order to obtain voltage at the terminals of the testing cup.

Clutch-Type Split-Phase Refrigerator Motor

A clutch-type split-phase refrigerator motor in which the starting current has been reduced to from 12 to 15 amp. has been placed on the market by the Day-Fan Electric Company, Dayton, Ohio. The efficiency and power factor also have been increased over those of the present repulsion-induction motors. The company states that the clutch which has been added to the motor is very dependable and has fewer working parts than are found on some brush-lifting devices. This motor is said to be a development of several years experience and a great number are now in operation. The manufacturer claims for the motor quietness, extraordinary efficiency in operation, high power factor, does not use brushes and does not introduce radio interference.

Disconnecting Switch

An improved form of single-pole disconnecting switch has been placed on the market by the General Electric Company for outdoor service in voltages from 7,500 to 154,000 with a minimum current rating of 600 amp. The new switch has extra large break distances. It is assembled on cemented cap-and-pin type insulators and is designed for horizontal or vertical mounting. It is known as the type FA-1.

The tongue-type contact is so designed that there is no soldering or brazing used in its construction. A positive blade latch, which makes it impossible for the switch to be opened until tripped by the movement of the operating eye, is also incorporated. Tripping and opening are accomplished by a single downward pull with the switch hook. The blade consists of two copper channel-sections mounted back to back to form a narrow truss. On switches of 37,000 volts rating and above, the channel sections are formed in a wide truss which provides increased stiffness and mechanical strength. The standard switches are equipped with multi-bolt punched-tube terminals, with or without extended guide clamps.

Portable Test Set

A portable truck-type high-voltage set for testing insulation and also transformer and circuit-breaker oil has been placed on the market by the Westinghouse Electric & Manufacturing Company. This set has a maximum testing voltage of 50,000 volts. The complete equipment consists of a testing transformer, auto-transformer, induction regulator, oil-testing cup and control equipment. The transformer of this set is of the oil-insulated, self-cooled, shell-type construction. One end of the high voltage winding is solidly grounded to the tank and the other is brought through the cover by means of a bushing. The auto-transformer adapts the set for the different primary voltage ratings. The induction regulator gives a variable, test voltage from zero to 50,000 volts in a continuous smooth curve. Red and green indicating lamps are provided, the green indicating voltage on the supply circuit terminals and the red showing potential on the high-tension terminals.

The control circuit consists of an overload relay with an electrical reset, a double-pole contactor with blowout coils and a make-and-break interlock for the signal lamps, all controlled from a pushbutton. A voltmeter coil is provided on the testing transformer, so designed as to develop a voltage equal to ½ per cent of the developed voltage. The terminals of this coil are brought out to suitable binding posts for voltmeter connection. As a further means of indicating test voltage a dial calibrated to the approximate high-tension voltage is provided on the tank cover with a pointer geared to the regulator shaft.

MOTORS FOR USE IN EXPLOSIVE ATMOSPHERES—A line of both alternating- and direct-current motors, built for application where explosive gases, fumes or dust are present, is announced by the General Electric Company. These motors have been approved by the Underwriters' Laboratories for operation under such conditions. The announcement of the complete line marks the culmination of several years of application in individual sizes and rating. The motors bear the designation "Class BU Form JA" and are of a totally inclosed design.

Electrical Patents

Announced by U. S. Patent Office

(Issued April 24, 1928)

1,667,638. ADJUSTABLE MAGNET DEVICE; H. B. Rex, Lynn, Mass. App. filed July 29, 1927. For controlling the effective flux of permanent magnetic damping devices such as those employed in integrating meters.

1,667,647. ELECTRIC MOTOR; E. F. W. Alexanderson, Schenectady, N. Y. App. filed March 11, 1925. Reversible motor wherein the same coils are utilized to produce both the exciting and commutating motor field fluxes.

1,667,650. THEFT SIGNAL SWITCH; J. P. Bradley and O. A. Prough, Weed, Calif. App. filed April 29, 1925.

1,667,652. CONTACT FINGER; F. E. Case, Schenectady, N. Y. App. filed April 22, 1925. For drum controllers.

1,667,655. CONTROLLING OR TRIPPING APPARATUS FOR ALTERNATING-CURRENT ELECTRIC CIRCUITS; H. W. Clothier, Wallsend-on-Tyne, and W. A. A. Burgess, Monkseaton, England. App. filed Sept. 17, 1925.

1,667,656. ANTITHEFT ATTACHMENT FOR METERS; W. A. Dilzell, New Orleans, La. App. filed Aug. 16, 1926.

1,667,660. LIQUID CONTACT CONNECTER; E. H. Gehm, Stockton, Calif. App. filed Jan. 27, 1927.

1,667,662. PROTECTIVE ARRANGEMENT; H. S. Holbrook, Rugby, England. App. filed Feb. 11, 1926. For the circuits of electric traction systems.

1,667,664. COMPENSATED INDUCTION MOTOR FOR SINGLE OR POLYPHASE ALTERNATING CURRENT; F. Kade, Kiel, Germany. App. filed June 20, 1925.

1,667,672. FREQUENCY CHANGER; S. P. Nixdorff, Schenectady, N. Y. App. filed Sept. 22, 1926.

1,667,674. SYSTEM OF DISTRIBUTION; O. Pollok, Berlin-Halensee, Germany. App. filed May 9, 1925. In which a mercury arc rectifier is employed in connection with translation devices capable of developing a counter electromotive force.

1,667,688. CLAMP FOR CONNECTION BOXES; W. Goetzelman, Chicago, Ill. App. filed Aug. 30, 1926.

1,667,702. CONNECTER; R. E. Powell, Toledo, Ohio. App. filed April 23, 1926. For storage battery.

1,667,704. TERMINAL FOR STORAGE BATTERIES; R. A. Szeits, Hawthorne, Calif. App. filed Sept. 14, 1926.

1,667,705. SELF-INDUCTION COIL; K. von Wysiecki, Lausanne, Switzerland. App. filed Nov. 28, 1925.

(Issued May 1, 1928)

16,947 (reissue). MOTOR-CONTROL SYSTEM; H. W. Williams, East Pittsburgh, Pa. App. filed Sept. 8, 1923. Employed in connection with elevators, machine tools and similar machines.

1,667,716. KEY-CONTROLLED LIGHTING AND IGNITION SWITCH; S. F. Briggs, Milwaukee, Wis. App. filed March 15, 1915.

1,667,718. MACHINE FOR DRIVING NUTS, SCREWS, AND THE LIKE; E. L. Connell, East Cleveland, Ohio. App. filed Dec. 11, 1925.

1,667,726. ELECTRICAL HAIR-CURLING APPARATUS; C. Fayer, Flushing, N. Y. App. filed June 18, 1925.

1,667,743. VOLTAGE-GRADIENT REGULATOR FOR HIGH-TENSION CABLE ENDS; E. G. Sievert and H. Svensson, Sundbyberg, near Stockholm, Sweden. App. filed Nov. 9, 1925.

1,667,746. MAGNETIC ALLOY; W. S. Smith, Newton Poppleford, H. J. Garnett, Sevenoaks, and J. A. Holden, Gidea Park, England. App. filed Jan. 21, 1927. Magnetic substantially carbon free material comprising iron 10 to 17 per cent, silicon 1.5 to 4 per cent, a fourth metal selected from the group comprising chromium, tungsten, vanadium, and molybdenum 1 to 4 per cent and the balance nickel.

1,667,747. RELAY FOR ELECTRICAL CONTROL APPARATUS; H. E. Somes, Philipse Manor, N. Y. App. filed Oct. 19, 1923.

1,667,752. REGULATING MEANS FOR SYSTEMS OF ELECTRICAL DISTRIBUTION; P. H. Thomas, Upper Montclair, N. J. App. filed Aug. 27, 1924. A plan and a suitable apparatus for supplying electric power to local consumers from a high tension electric source and at the same time to supply power to or receive power from general distribution circuits connected at the same load point and to so regulate the relations of these elements as to preserve a suitable range of voltage and of current on each.

1,667,757. LIGHT SIGNAL; W. B. Wells, Wilkinsburg, Pa. App. filed Jan. 23, 1925. As used in railroad work.

1,667,758. ELECTRIC BOILER APPARATUS; G. Welter, New Haven, Conn. App. filed June 28, 1926.

1,667,766. MAGNETIC CHUCK; J. Bing, Eisenach, Germany. App. filed March 26, 1925.

1,667,775. SURGICAL BAKER; W. S. Edmands, Boston, Mass. App. filed March 8, 1926.

1,667,794. DEVICE FOR THE SYNCHRONIZATION OF ALTERNATING-CURRENT MACHINES; R. Michl, Kosice, Czechoslovakia. App. filed Jan. 10, 1924.

1,667,813. OUTLET-BOX-SUPPORTING MEANS; J. Morgenstern, Cleveland, Ohio. App. filed Oct. 24, 1924.

1,667,814. CABLE CLAMP; J. Morgenstern and C. Raus, Cleveland, Ohio. App. filed March 17, 1926. For securing cables or conduits of electric wiring systems to receptacles such as switch boxes, outlet boxes, etc.

1,667,815. ELECTRIC HOT-WATER FAUCET AND MEANS FOR OPERATING SAME; A. M. Nickerson, Winthrop, Mass. App. filed May 10, 1926.

1,667,816. ELECTRIC RADIATOR; A. M. Nickerson, Winthrop, Mass. App. filed April 13, 1927.

1,667,817. ELECTRODE; Y. Noishiki, Tokyo, Japan. App. filed Jan. 26, 1927. For electrotherapeutic application.

1,667,824. MULTIPLE-UNIT CABLE; A. L. Richey, Boonton, N. J. App. filed Dec. 5, 1925.

1,667,828. LAMP POST; J. W. Speer, Lansing, Mich. App. filed Feb. 23, 1926.

1,667,857. HEATING UNIT; C. C. Harpster and W. R. King, Mansfield, Ohio. App. filed April 2, 1927. Incased tubular heating units.

1,667,871. TROUGHING SYSTEM FOR ELECTRIC-APPLIANCE RECEIVING CABINETS; J. Sachs, Hartford, Conn. App. filed Sept. 7, 1926. For meter service layout.

1,667,873. DISK-PILE LIGHTNING ARRESTER; J. Slepian, Swissvale, and S. M. Pineles, Pittsburgh, Pa. App. filed Nov. 23, 1922.

1,667,879. TUBULAR HEATER AND METHOD OF MAKING THE SAME; J. C. Woodson, Mansfield, Ohio. App. filed Sept. 2, 1926.

1,667,905. ELECTRICAL MEASURING INSTRUMENT; J. Slepian, Swissvale, Pa. App. filed Dec. 15, 1924. For measuring the maximum value of an alternating voltage regardless of the wave form or frequency.

1,667,910. LAMP GRIP; J. R. Townsend, South Bend, Ind. App. filed March 24, 1924. Retainers for electric lamps, fuse plugs and the like.

1,667,914. PRESSURE-GOVERNED CIRCUIT CONTROLLER; R. E. White, Chicago, Ill. App. filed Jan. 29, 1923.

1,667,954. FLUID PURIFIER; F. J. Simington, Chicago, Ill. App. filed July 12, 1926.

1,667,988. AUTOMATIC ELECTRIC TOASTER; G. P. Richardson, Los Angeles, Calif. App. filed March 5, 1927.

1,668,016. CRYSTAL WIRE FILAMENT FOR INCANDESCENT ELECTRIC LAMPS AND THE METHOD OF WINDING IT; M. Hauschild, Dresden, and W. Berger, Blasewitz-Dresden, Germany. App. filed Feb. 23, 1926.

1,668,043. EXTENSION GRIP FOR ELECTRIC-LAMP CONNECTERS; E. H. Bixby, Astoria, Ore. App. filed May 1, 1926.

1,668,049. DE-ELECTROLIZER; M. A. Clinton and M. W. Collet, Philadelphia, Pa. App. filed May 20, 1922. Used to remove charges of static electricity.

1,668,106. HOT-WIRE VACUUM METER; W. Dällenbach, Zurich, Switzerland. App. filed May 12, 1924.

1,668,110. ELECTRICAL TRANSFORMER CONSTRUCTION; J. Fischer, Baden, Switzerland. App. filed Feb. 27, 1926. Tapping arrangements.

1,668,111. TERMINAL FOR ELECTRICAL ACCESSORIES; J. E. Gaffney, Birmingham, England. App. filed Dec. 16, 1924.

1,668,115. MAGNETIZABLE MATERIAL; E. Gumlich, Berlin-Charlottenburg, Germany. App. filed Nov. 30, 1926.

1,668,138. FUSE PLUG; L. Baenziger, Abington, Mass. App. filed Feb. 23, 1927.

1,668,142. HEATED ROLLER; J. D. Conger, Clarkston, Wash. App. filed March 7, 1927. Electrical combined, smoothing, heating and securing device for floor coverings, designed primarily for use in connection with linoleum.

1,668,161. PORTABLE ELECTRIC-CONTROL APPARATUS; J. E. Long, Multnomah, Ore. App. filed April 13, 1927. For electric signs.

1,668,177. ALTERNATING-CURRENT MOTORS; H. Weichsel, St. Louis, Mo. App. filed April 4, 1925. Across-the-line type synchronous motor.

New Trade Literature

MOTORS.—The Century Electric Company, 1806 Pine Street, St. Louis, is distributing a folder, form 663, describing and illustrating its most recent addition, the type DM direct-current motors.

POLE MOUNTS.—The Malleable Iron Fittings Company, Branford, Conn., is distributing a bulletin describing the "Williams" pole mounts for wood and tubular iron poles. Illustrations showing typical pole mount installations are included.

VACUUM-TUBE SYNCHRONIZING EQUIPMENT.—The General Electric Company, Schenectady, N. Y., has issued bulletin GEA-777A, covering its vacuum-tube synchronizing equipment, such as bushings equipped with capacitance transformers, outdoor amplifiers and indoor amplifier assembly, including motor-generator set and synchroscope. Illustrations and dimensions of the equipment are included.

SAFETY SWITCHES, POWER PANELS, ETC.—The Square D Company, Detroit, has issued catalog No. 33 covering its products, including safety switches, motor starters, power panels, porcelain insulators, "Square-Duct," test plugs and sockets, voltage testers, etc. Tables giving dimensions of switch boxes in inches and knockout sizes and locations and wiring data for motors are included.

INDUSTRIAL LIGHTING. — "Modern Retailing Success" is the title of booklet No. 444-A issued by the Holophane Company, 342 Madison Avenue, New York City. It contains an article entitled "Special Lighting," which features its control lenses for special lighting, and a number of illustrations showing various installations of Holophane reflector-refractors for show-window lighting, department stores, etc., are included. The company also is distributing booklet No. 600 covering lighting specifics for gasoline-filling stations which gives full information on Holophane units for the lighting of every part of the gasoline station and contains illustrations showing typical installations.

ELECTRICAL MEASURING INSTRUMENTS.—The Jewell Electrical Instrument Company, 1640 Walnut Street, Chicago, has issued catalog No. 16, covering the Jewell electrical measuring instruments. It describes and illustrates the various portable type instruments, switchboard and panel-mounting instruments and radio instruments. It also contains descriptions of its X-ray and electro-therapeutic and automotive testing instruments. The company also is distributing a circular which features its new line of "Master" portable instruments and its 7-in. line of switchboard instruments. The catalog is very complete and contains dimension diagrams and reproductions of the various scales employed.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase is desired in Wellington, New Zealand (No. 31,168), of small electrical devices.

An agency is desired in Dublin, Ireland (No. 31,112), for household electrical appliances.

Purchase is desired in Iquique, Chile (No. 31,109), of electric portable paint-spraying equipment for automobile bodies and metal work.

Purchase is desired in San Luis, Cuba (No. 31,111), of electric household refrigerators.

An agency is desired in Carmaux, France (No. 31,170), for sewing-machine motors.

Purchase and agency are desired Genoa, Italy (No. 31,128), for electrical machinery for ships and motor ships.

Purchase and agency are desired in Cardiff, Wales (No. 31,110), for electrical vibrators.

An agency is desired in Bietigheim, Germany (No. 31,127), for electrical washing machines.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Water Power Serves Nation's Homes and Industries

THE preponderating percentage of energy generated from fuel in the more densely populated northeastern quarter of the United States and the predominance of water power in the far West and in the Southeast are evident from every fresh survey of our national electrical output. In the summary of operations of public utility plants for 1927, published in the ELECTRICAL WORLD of April 28, 1928, that situation again appears.

The hydro output amounted to 37.2 per cent of the total. More than half of it was reported from the Pacific and Middle Atlantic States. Water furnished more than nine-tenths of the energy in the Pacific States, not quite seven-eighths of that in the mountain region and almost two-thirds of that in the East South Central States. Even in these regions, liberally as they are endowed with water, reliance must nevertheless to some extent be put on fuel.

During 1927 the installed generator capacity increased by 2,292,506 kw. to a final total of 27,690,891 kw. The greatest increase in any one region, in rate as well as in amount, occurred in the South Atlantic States; the change from 2,835,074 to 3,475,795 kw. between the beginning and the end of the year exceeded 600,000 kw., or 22 per cent. Next came the Middle Atlantic and East North Central States. The West South Central region had the second highest rate, 19 per cent.

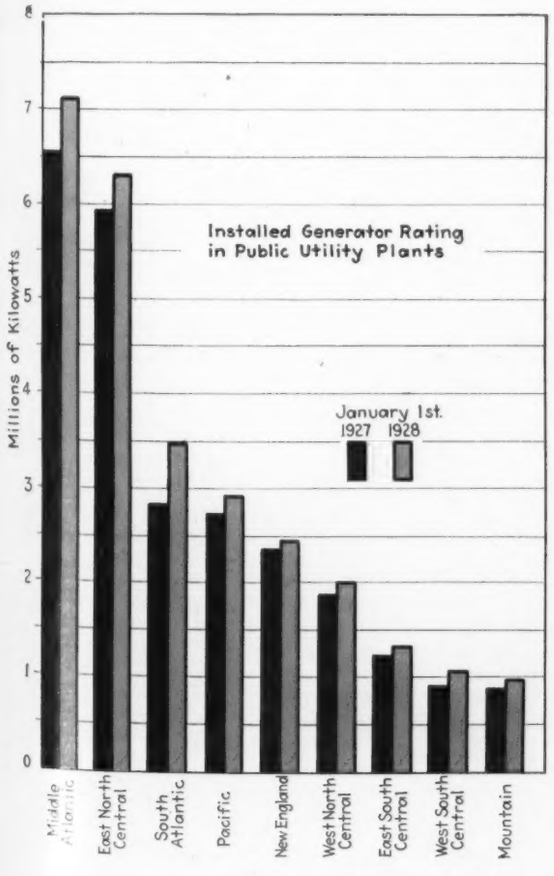
Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers to quote or use them for any legitimate purpose. While no acknowledgment is required, users will, by crediting the ELECTRICAL WORLD, help it in obtaining and compiling further basic information.

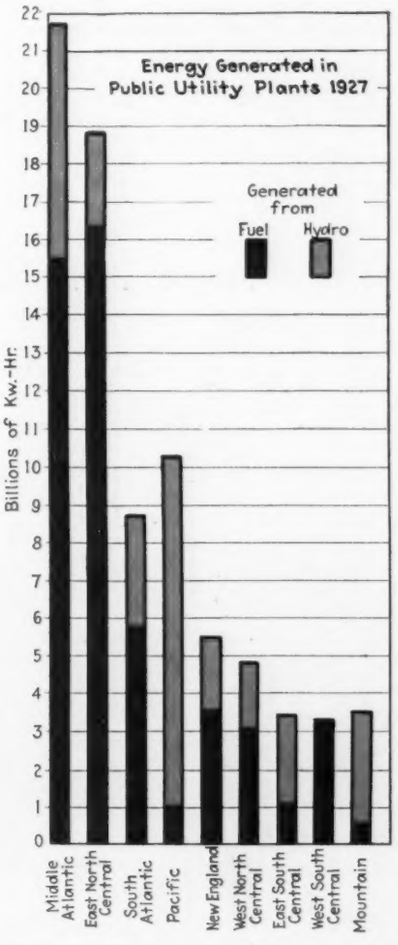
The Middle Atlantic, with 7,113,361 kw., and the East North Central, with 6,311,870 kw., continue to be the sections with the largest total rating, as might be expected in view of their rank in population and their industrial importance.

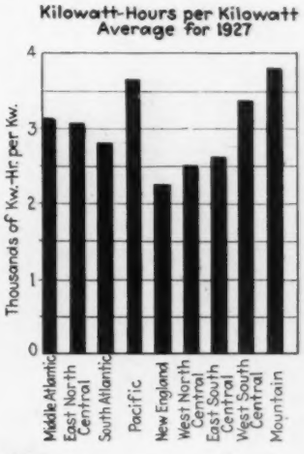
In kilowatt-hours per kilowatt, considering the latter as the mean of the installations at the beginning and end of the year, the two great water power regions stand out conspicuously. Both have large long-hour loads and the amount of steam reserve necessary is comparatively small. The Mountain States show the highest regional average, namely, 3,800 kw.-hr. per kilowatt. New England, where the lighting load is relatively large, fluctuates widely with the seasons, and therefore demands large peak-load capacity, and is at a definite disadvantage in this regard. No doubt the erection of new plants of high efficiency in the very recent past and the impossibility of at once eliminating the older plants have lowered the load factor in some regions, but this condition is probably to be regarded as temporary and unavoidable.

The national totals corresponding to these various regional figures are: 80,205,474,000 kw.-hr. generated in 1927; an installed rating of 25,398,385 kw. at the beginning of 1927 and 27,690,891 kw. at the beginning of 1928.

The data here quoted relate to all public utility plants in excess of 100 kw. and include not only those for light and power but also railway and other plants generating energy not exclusively for private use.







Increase has occurred in every section. Output per kilowatt varies widely

Industrial Activity in the North Central States 5.7 per Cent Over 1927

MANUFACTURING plants in the North Central States have been reporting a rate of operations above that of the same month in the year previous ever since last October. The low point in activity reached during the winter of 1926 does not appear to have been duplicated during the past winter, due very largely to the fact that the production of equipment and replacement parts in the automobile industry was some 30 per cent above that of the winter of 1926, thereby raising the index of operations in that industry to a plane materially above that of the year previous. Since December the operations of industry in this section have followed very closely the trend established during 1927, but on a plane about 5 or 6 per cent above that of last year.

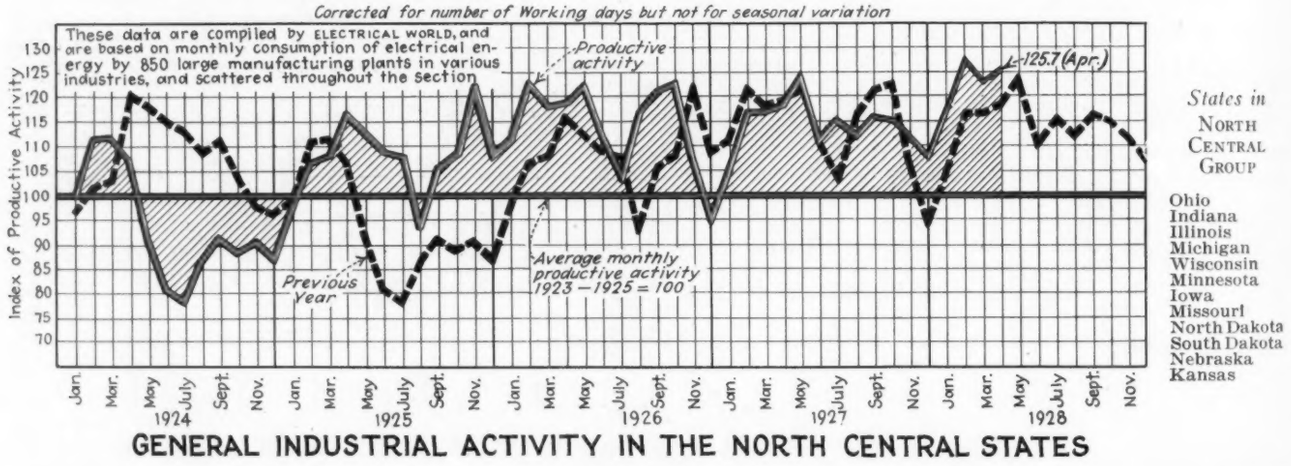
Indexes of Productive Activity in the North Central States

All Figures Adjusted for Number of Working Days

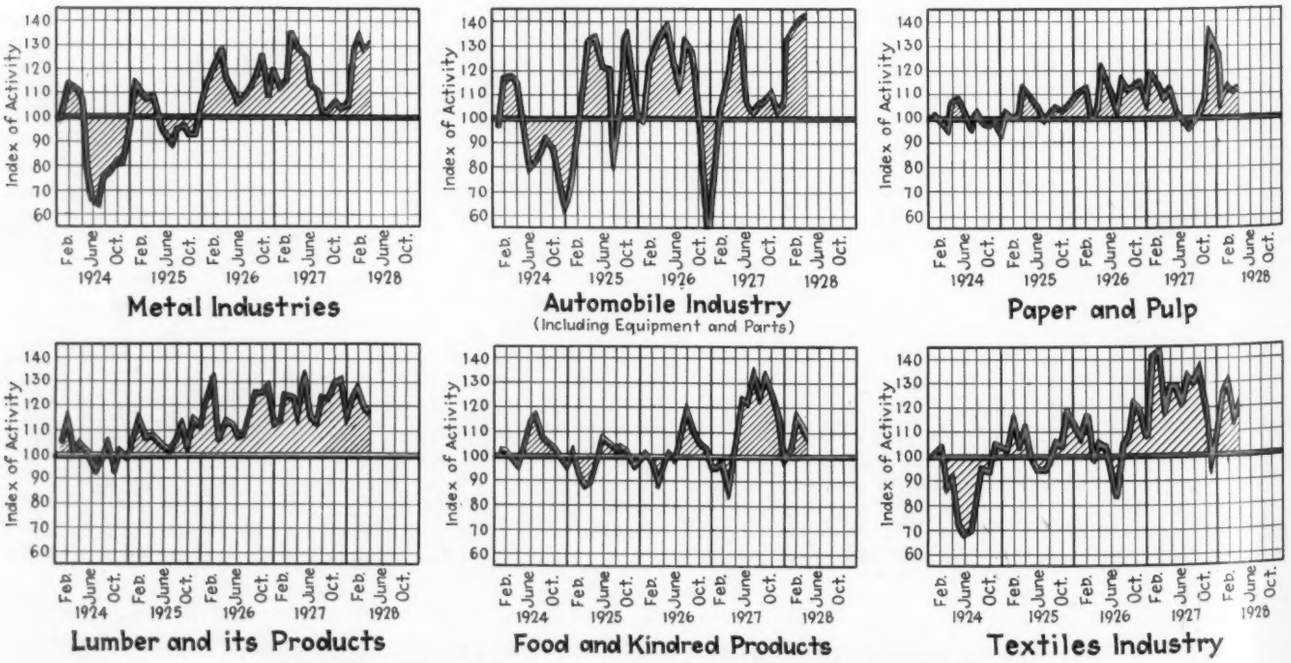
	April, 1928	March, 1928	April, 1927	Average for First Four Months, 1928	Average for First Four Months, 1927
All industries	125.7	122.3	118.9	123.2	114.8
Chemical and allied products	146.2	129.7	97.4	113.5	94.2
Textiles	123.8	112.7	129.6	123.4	133.8
Lumber and its products	118.5	119.8	115.2	121.7	119.7
Paper and pulp	111.8	110.2	112.3	110.5	113.8
Automobile, including the manufacture of parts	148.7	136.0	138.3	142.3	109.5
Rolling mills and steel plants	129.9	127.5	129.5	131.2	125.6
Metal-working plants	133.3	130.0	.....	131.1	.....
Food and kindred products	108.7	115.2	108.2	111.5	.....
Leather and its products	99.8	109.3	88.7	110.7	.....
Rubber and its products	131.2	139.3	115.7	137.7	.....
Stone, clay and glass	114.5	101.8	111.0	99.8	.....

The rate of operations in April was about 2.8 per cent above March and 5.7 per cent above April last year. During the first four months of the current year the average rate of general productive operations in this section was about 7.4 per cent above that during the same period in 1927.

ELECTRICAL WORLD *Barometer of Industrial Activity in the North Central States*



GENERAL INDUSTRIAL ACTIVITY IN THE NORTH CENTRAL STATES



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE NORTH CENTRAL STATES